Video quality testing of automotive infotainment devices

Automotive Infotainment Testing

Current status

A change in paradigm is quite evident in how users interact with their car infotainment devices. Users are well acquainted with smartphones and the applications that run on them. Most popular smartphone applications are video intensive. Passengers try to replicate the same familiarity and user experience inside the car by plugging into Apple CarPlay or Android Auto mode.

With the continued evolution of automotive infotainment devices, modern-day car head units natively support all communications and broadcast functions. The infotainment device's display is the centerpiece of the car head unit, and audio/video picture quality plays a key role in the overall user experience.

Challenges

Normally, video content is streamed through multimedia applications (Netflix, YouTube, Facebook, etc.) via a data connection over a 4G/3G cellular network or non-cellular WLAN access point. Digital television (DTV) applications can also run over a DVB-T/DVB-T2 or ATSC 3.0 network.

Since a car is not always static, the infotainment device needs to handle complex fading scenarios, multipath signal propagation and Doppler effect due to the speed. This gives rise to a handful of audio and video error sources.

In the case of IP-based connections, errors are introduced due to packet loss, packet delay, packet jitter. Frozen/dropped frames, delay, loss of sync between audio and video, etc. cause errors during DTV playback.

Testing the display for audio and video distortions is therefore a key and essential part in ensuring high-quality performance of every infotainment unit.

Rohde&Schwarz solution

The Rohde&Schwarz solution combines the R&S®CMW500 wideband radio communication tester and the R&S®VTE video tester to simulate an end-to-end real-world communications link and perform video quality measurements inside the lab.

The infotainment device is connected via the air interface emulated by the R&S®CMW500. In contrast to the real world, this offers a controlled test environment in which a number of network parameters can be adjusted. Data traffic can be reproducibly analyzed under ideal conditions, and also under non-ideal conditions by introducing IP impairments or fading influences.

The A/V distortion measurement feature on the R&S®VTE compares the video and audio output of a device under test (DUT) in realtime with a previously recorded reference. Rohde&Schwarz A/V distortion analysis measures the deviations with respect to a recorded reference (as opposed to absolute A/V quality).

Using a recorded reference has the advantage that all video scaling applied to the signal in the video processing chain is excluded from the test. Instead, the DUT performance is evaluated to allow reliable identification of influences related to faulty DUT behavior or other disruptions.

Rohde&Schwarz A/V distortion analysis can be used with all common A/V interfaces and associated signal formats in conjunction with the following input modules:

- Analog A/V: composite (SD), component (SD/HD), VGA
- MHL™ version 1.2 and 2.0, resolution up to 1920 × 1080 pixel, 8 × audio (PCM up to 48 kHz)
- HDMI™ version 1.4 and 2.0 (3G), resolution up to 4k (4096 × 2160 pixel), 8 × audio (PCM up to 48 kHz)

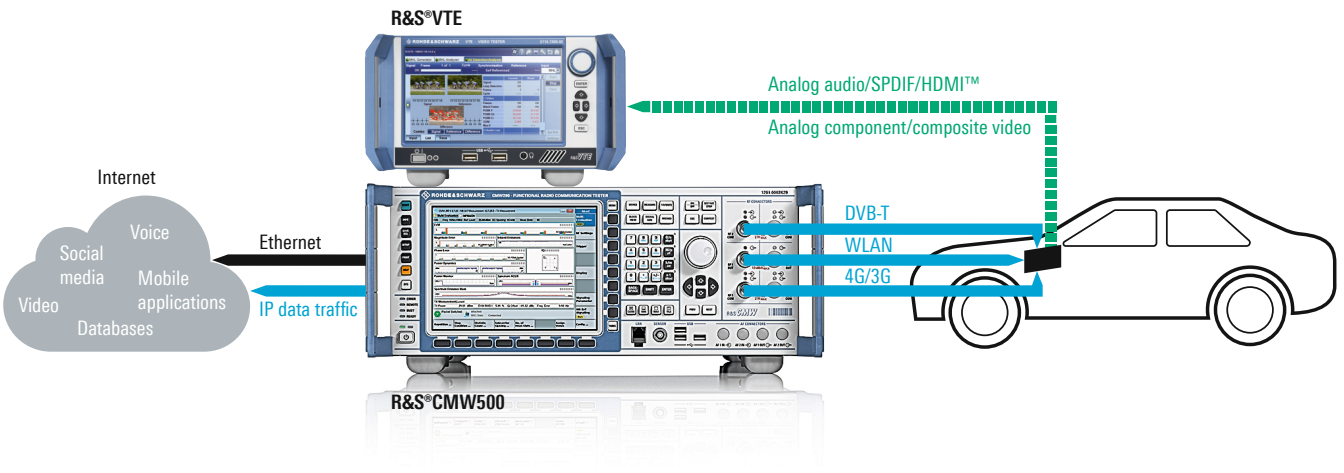
Other digital interfaces such as SDI, DVI, LVDS and DisplayPort can be accommodated using external signal converters that support HDMI™. This makes it possible to analyze the LVDS output, for example.

Additionally, the R&S®CMW500 with integrated data application unit (DAU) provides the IP infrastructure and preconfigured services. The DAU can function as an IP multimedia subsystem (IMS) server, a video streaming server, a secure user plane location (SUPL) server, etc. When testing user-specific services that require a dedicated server, a direct connection to the Internet is set up via Ethernet. In this case, the DAU functions as a gateway to the Internet to permit data analysis.

See also

www.rohde-schwarz.com/CMW
www.rohde-schwarz.com/product/VTE

Measurement setup for video quality testing on infotainment devices



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PD 5215.7200.92 | Version 01.00 | February 2018 (ch)
Video quality testing of automotive infotainment devices
Data without tolerance limits is not binding | Subject to change

5215720092

5215.7200.92 01.00 PDP 1 en