ClearMotion™ Technology

MediaTek White Paper

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Introducing ClearMotion™

MediaTek's ClearMotion is a display technology that enhances visual quality on video playback and streaming. ClearMotion performs automatic frame rate conversion from various kinds of video source frame rates to high-quality 60fps or 120fps display frame rates for significantly clearer and smoother playback.

For simplest frame rate conversion from lower frame rate to higher frame rate, such as 24Hz to 60Hz, the general method is to repeat input frames to meet output frame rate, as shown in Figure 1. In this case, however, every frame will show different duration in the panel, such as the first frame shows three time slots, while the second frame shows two time slots. (One time slot is 1/60 second.) And, the fast moving objects show obvious discontinuous moves. The unsmooth and jittery artifact is obviously discovered.

MediaTek introduces into the market a better way to perform frame rate up-conversion with its ClearMotion Technology. In this technology, the motion direction and motion speed can be precisely estimated and true position of objects can be interpolated at the right time. Therefore, moving objects look much clearer and jitter artifacts can be eliminated. Figure 2 is the quality comparison example for 24Hz to 60Hz by ClearMotion.

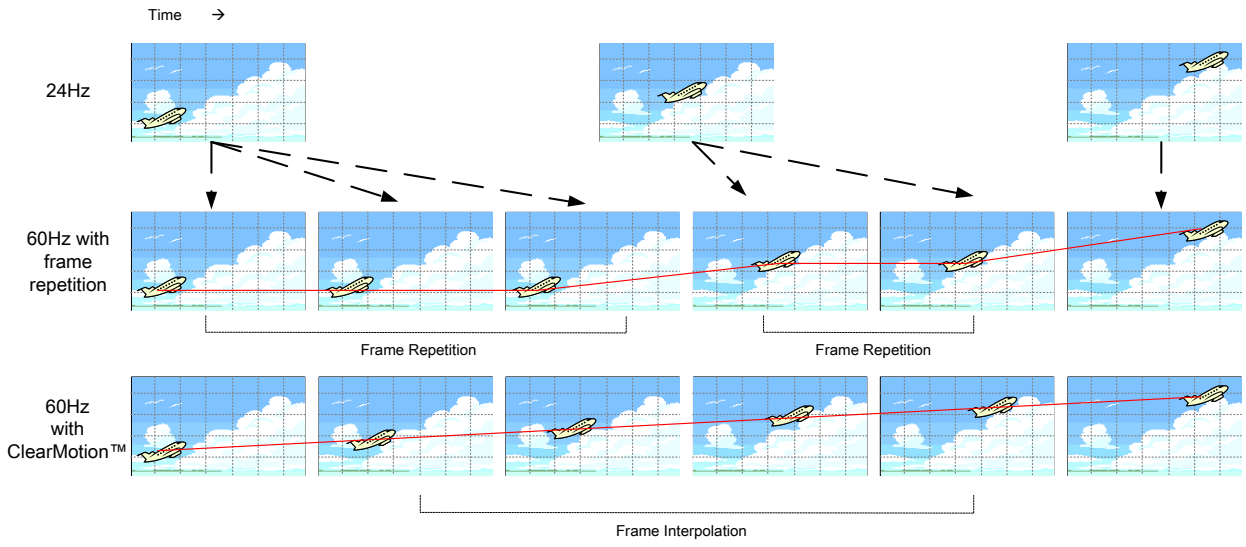

Figure 1. Frame Rate Conversion from 24Hz to 60Hz

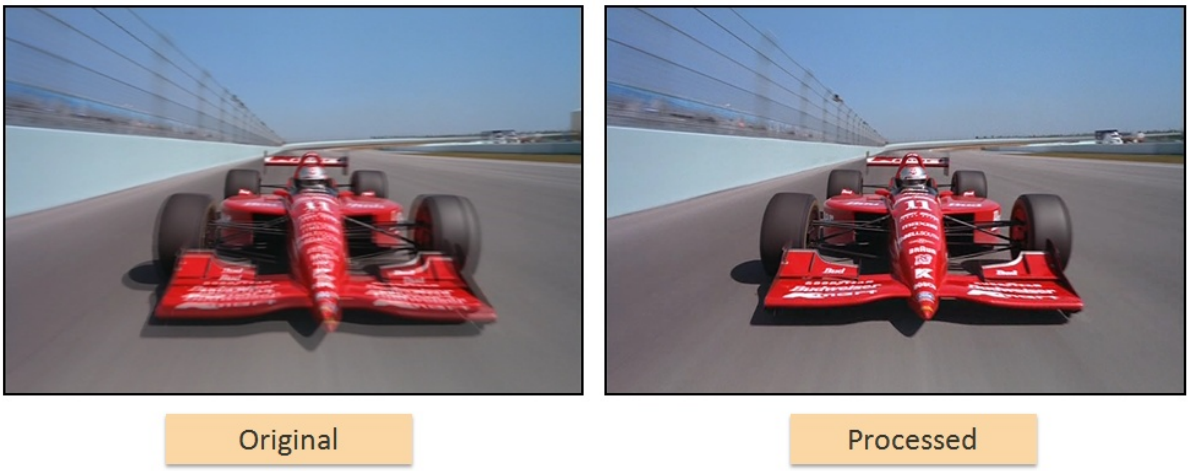

Figure 2. ClearMotion Quality Comparison

MediaTek's Innovative Solution

ClearMotion technology achieves high quality frame rate conversion by Motion Estimation/Motion Compensation (MEMC) technology which was leveraged from MediaTek's leading display technology developed in digital TV. MEMC frame rate conversion was previously only available on high-end DTVs. MediaTek is the first in the industry to make this technology a reality on mobile platforms.

The ClearMotion block diagram is shown in Figure 3. First, Motion Estimation (ME) is responsible for finding the best motion vector for each image sub-blocks. After ME, the block motion vectors are refined to pixel motion vectors by the Motion Vector Processing (MVP). At the final stage, the Motion Compensated Interpolation (MC) generates interpolated frames according to the pixel motion vectors from MVP.

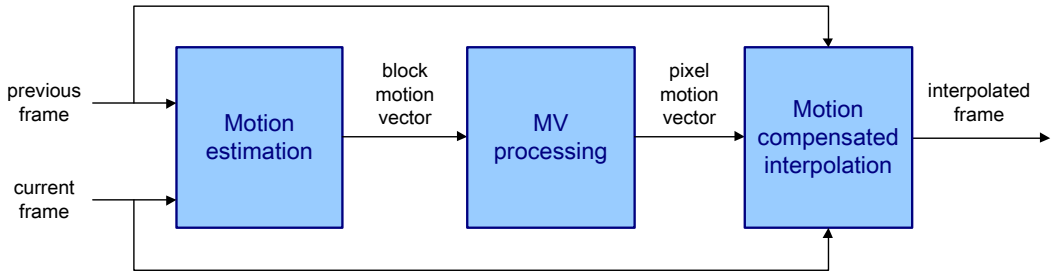

Figure 3. ClearMotion Block Diagram

Instead of video playback and streaming, another good application for MediaTek's ClearMotion technology is combining with DFR (dynamic frame rate) video recording. As we know, DFR has better video quality for brightness and noise when recording in low-light or indoor environments, but lower frame rates may result in jitter effects. Combined with ClearMotion, DFR videos can record at better brightness and less noise, and keep high frame rate smooth and clear while in playback mode.