Method and Device for Detecting Flickers in Television Pictures

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The present invention relates to a method and a device for detecting flickers in television pictures. In the production of films and television programs, there is an editing technique of alternating two different scenes at one-frame intervals or at short intervals to produce special effects. A similar effect may be achieved by stroboscopic illumination. These scenes appear as striking flickers of light on screens. Some viewers watching these scenes experience distressing symptoms ranging from nausea and dizziness to epileptic seizures.

The conventional technique for detecting flickers considers a flicker based on a change of scene or cut. Here, a flicker is defined as a series of such cuts. The conventional technique has a drawback as follows. The field difference or frame difference occurs successively resulting in a false detection of flickers when a scene includes rapid motions or a scene is switched through fading.

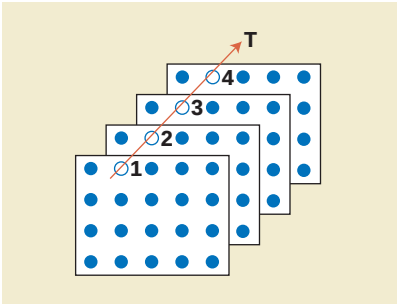

Figure 1

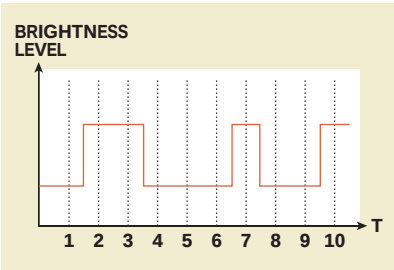

Figure 2

According to the invention, the flicker is taken to mean that a bright scene changes to a darker one with some delay. Here, the change in brightness in a scene means a field difference or a frame difference. The brightness is determined to have returned to the original level if the correlation, which is calculated between field differences or frame differences with an appropriate delay time, is found to be strongly negative. The flicker detection method of this embodiment is illustrated using the frame structure of the scene in Figure 1. In the figure, blank circles and filled circles represent picture element or pixels and the video has a sampling structure in which sampling is performed in the horizontal, vertical, and time-axis directions. Figure 2 shows a time course of brightness of the open circles. When the brightness or luminance changes from t=1 to t=2 and t=3 to t=4, one cycle of flicker is detected. When the brightness changes are near a certain frequency, flicker is determined to have occurred. Figure 3 shows an example of a flicker detection device that uses the above flicker detection method. The input video signal (IN) accepts an NTSC composite signal or an RGB component signal. The flicker detection of this embodiment detects a large area flicker even when the flickering image has a significantly low spatial resolution. For this reason, the clock frequency of the A / D converter (2) is set to 70 times the line frequency. The sampling frequency is about 1.1 MHz, and the band of LPF (1) is around 0.5 MHz. The signal written into FIFO (7) is read out at the rate of $2f_H$ and sent to a field delay circuit. Differences between successive frames or fields are processed in ROM (9) and the correlation evaluation value is calculated from the product of the current input signal and the delayed input signal in ROM (12). When this value exceeds a given threshold and the flicker event occurs successively over a certain length of time, the frequency of the event and its duration are computed in personal computer (15). The personal computer displays the correlation value in real time on its screen and raises an alarm when the frequency and duration exceed predetermined warning levels. The flicker of a specific color signal or of the luminance signal can be also detected by the invention.

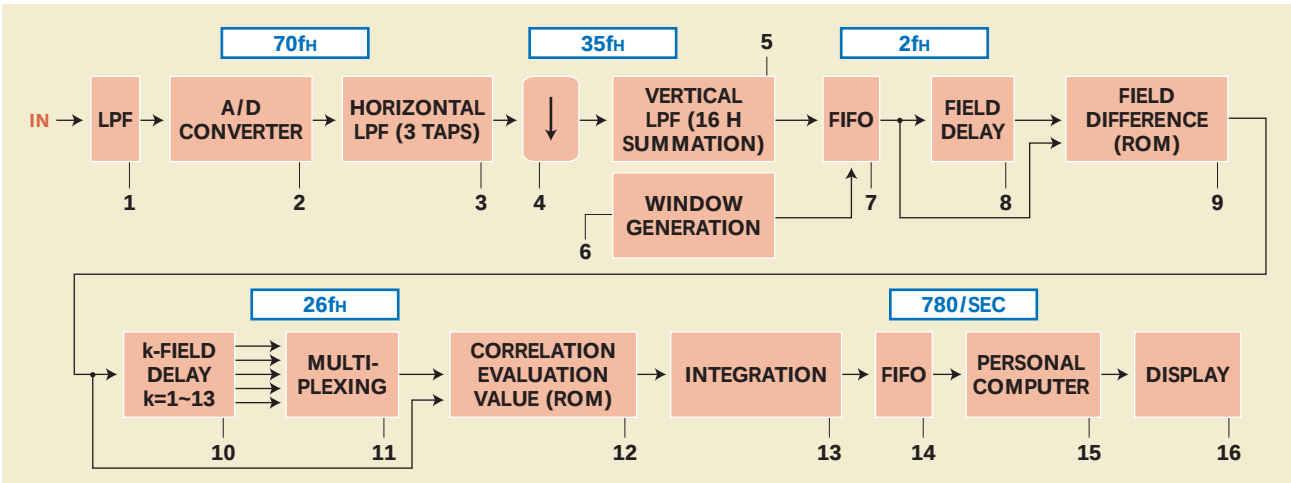

Figure 3