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Video Data Stream Compression Models to Reduce Data Storage Space

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Abstract: Techniques are disclosed which reduce the required storage capacity for streams of high-resolution video. The captured video is post-processed, with certain portions of the video being converted to, and stored as, low-resolution video rather than high-resolution video, thus using less data storage space.

This disclosure relates to the field of video processing.

Techniques are disclosed which reduce the required storage capacity for streams of high-resolution video.

Storing a continuous stream of high resolution video can be expensive, as it can require 100+MB per minute of storage. As a result, rather than performing continuous storage, some applications such as security video perform only intermittent storage, for example beginning storing on detection of movement in the scene, and then stop storing after a preset amount of time, or upon other conditions such as a lack of further movement. Applications which require continuous storage may capture and/or store video at a lower resolution, which disadvantageously reduces video quality. In other continuous video applications, the storage may be used as a circular buffer in which the oldest video data is overwritten when the amount of captured video exceeds the storage capacity of the data store, so older video data may no longer be available when needed.

According to the present disclosure, high resolution video capture and high efficiency video storage techniques maintain high resolution data from security cameras and hobby cameras while also providing more efficient storage of the video stream in applications that do not require all video data to be saved in a high resolution format. While many applications of video cannot tolerate any low resolution sections, other video streams can tolerate a significant amount, in some cases about 70-80%, of low resolution data interleaved with high resolution data.

The data is captured in a high resolution format and sent to local memory storage. Then the data is read from the memory by a post-processor, and the video is processed following a user-selected compression model and stored in a video file of the same file type, but modified to reduce the required storage space.

Considering the processing in more detail, during initial setup, the user selects a desired data compression option (or no compression). The video is captured at high resolution and the video data is buffered for a short time. A number of alternative post-processing techniques maintain high resolution data while also providing more efficient storage of the video stream.

In one technique, triggers (which may be manual or automatic) indicate whether the subsequent video stream is to be stored as high-resolution or low-resolution video. If the trigger is activated for high-resolution storage, the data would be stored in a high resolution format until a trigger indicating low-resolution is received, or for a defined time window (after which subsequent video is stored in a low-resolution format).

In another technique, the video is stored at high resolution and then is re-written in a lower resolution when the amount of remaining storage space reaches a predefined threshold. In some versions, sections of video data indicated as important to maintain in high resolution format (e.g. as per a particular trigger) would not be re-written into lower resolution.

In yet another technique, a background process edits the video to remove small sections of frames in the data stream. This can reduce the saved data by 50% or more while still maintaining the context of the data and clarity of the stream.

In a further technique, the video stream is stored with an interleave of high resolution and lower resolution frames. This can significantly reduce the saved data while still allowing seamless viewing and maintaining high-resolution data integrity.

In an additional technique, successive scenes of high-resolution video are analyzed. Any video data that is changed between scenes is maintained in high resolution format, while unchanged video data in converted to a low resolution format. For example, the full frame is stored in high resolution at the beginning, but in many cases the background does not change and could be maintained in a low resolution format. In some cases, certain recognized objects in a video scene - for example, faces, persons, automotive vehicles (including license plate data) - is maintained in high resolution format, while the resolution of background data is reduced.

The disclosed video compression techniques models advantageously allow a video stream to be captured in high resolution and maintain critical video data to be maintained and reduce the require storage capacity.

Disclosed by Bert Martens, Hewlett Packard Enterprise.