Claims

1. A method for managing retrieval and transmission of reconstruction data from a server to a decoder, wherein the server includes a repository with one or more encoded signals, each encoded signal including a plurality of identified sets of reconstruction data encoded in accordance with a tiered hierarchy including multiple levels of quality, wherein a set of reconstruction data corresponding to a first encoded signal specifies to a decoder how to reconstruct a portion of a rendition of the first signal at a given level of quality based on a reconstructed rendition of a portion of the first signal at a lower level of quality and independently of any reconstructed rendition of other portions of the first signal at the given level of quality, the method comprising:

   determining a transmission bit rate and/or a highest level of quality expected to be supported by a decoder for the network connection;

   retrieving reconstruction data from the repository;

   transmitting the retrieved reconstruction data to the decoder, the decoder configured to reconstruct renditions of a signal based on the transmitted reconstruction data; and

   during the transmitting, updating the transmission bit rate and/or the highest level of quality expected to be supported by the decoder and varying a level of quality of the reconstruction data retrieved and transmitted to the decoder.

2. The method as in claim 1, wherein varying the level of quality includes:

   transmitting a first stream of reconstruction data to the decoder for play back of a first portion of the signal, the first stream of reconstruction data indicating how to reconstruct a rendition of the first portion of the signal up to a first level of quality in the tiered hierarchy; and

   transmitting a second stream of reconstruction data to the decoder for play back of a second portion of the signal, the second stream of reconstruction data indicating how to reconstruct a rendition of the second portion of the signal up to a second level of quality in the tiered hierarchy.

3. The method as in claim 2, wherein the first level of quality is higher than the second level of quality; and

wherein the second stream of reconstruction data comprises reconstruction data up to the second level of quality instead of the first level of quality in response to detecting the bandwidth currently available in a transmission channel (such as from information associated with a network congestion control mechanism running on the server for the network connection).

4. The method as in claim 2, wherein the second stream of reconstruction data comprises reconstruction data up to the second level of quality in response to receiving a request to transmit the second stream of reconstruction data at the second level of quality instead of the first level of quality.

5. The method as in claim 2, wherein the second stream of reconstruction data comprises reconstruction data up to the second level of quality in response to detecting a characteristic of the decoding resource.

6. The method as in claim 1, wherein the signal is a video signal and a set of reconstruction data at a given level of quality indicates how to reconstruct a rendition of an image/frame of the signal based on a reconstruction of the signal at a lower level of quality, independently of reconstructed renditions of other images/frames at the given level of quality;

wherein varying the level of quality during transmitting comprises varying at an arbitrary time sample of the video signal (such as at any given image/frame) a highest level of quality of reconstruction data that is retrieved and transmitted to the decoder; and

wherein varying the level of quality during transmission comprises varying in either direction along the tiered hierarchy of levels of quality (such as either moving from a higher level of quality to a lower level of quality or moving from a lower level of quality to a higher level of quality).

7. The method as in claim 1, wherein varying the level of quality includes:

for a first portion of the signal, producing a first stream of reconstruction data to include a sequence of reconstruction data from a lowest level of quality in the hierarchy to the first level of quality;

transmitting the first stream of reconstruction data to the decoder for play

back of the first portion of the signal in accordance with the first level of quality;

for a second portion of the signal, producing a second stream of reconstruction data to include a sequence of reconstruction data from the lowest level of quality in the hierarchy to the second level of quality, the second level of quality being different than the first level of quality; and

transmitting the second stream of reconstruction data to the decoder for play back of the second portion of the signal in accordance with the second level of quality.

8. The method as in claim 7, wherein the method further comprises:

transmitting the first stream of reconstruction data responsive to indication from the decoder that the user is performing play back of the first portion of the signal at a first play back speed; and

transmitting the second stream of reconstruction data responsive to indication from the decoder that the user is requesting play back for the second portion of the signal at a second play back speed, the second play back speed being different than the first play back speed.

9. The method as in claim 1, wherein varying the level of quality of the reconstruction data transmitted to the decoder includes:

producing a first stream of reconstruction data to include sets of reconstruction data to reconstruct portions of the signal in accordance with a first level of quality in the hierarchy;

transmitting the first stream of reconstruction data to the decoder to enable play back and navigation amongst the signal in accordance with the first level of quality;

producing a second stream of reconstruction data to include sets of reconstruction data to reconstruct the signal in accordance with a second level of quality in the hierarchy, wherein the second stream of reconstruction data is supplemental reconstruction data with respect to the first stream of reconstruction data, the second stream of reconstruction data indicating how to modify a rendition of the signal generated based on the first stream of reconstruction data to reconstruct the signal according to the second level of quality; and

subsequent to transmitting the first stream of reconstruction data,

transmitting the second stream of reconstruction data to the decoder for play back of the signal in accordance with the second level of quality.

10. The method as in claim 9, wherein the signal is a video signal, the first stream of reconstruction data is buffering information, and buffering information is transmitted at a level of quality that is lower than a target level of quality for play back.

11. The method as in claim 1, wherein varying the level of quality of the reconstruction data transmitted to the decoder includes:

retrieving sets of reconstruction data and producing a first stream of reconstruction data to reconstruct the signal in accordance with a first level of quality in the hierarchy;

transmitting the first stream of reconstruction data to the decoder to enable navigation amongst the signal played back at the first level of quality;

receiving a pointer value indicating a location in the signal, the pointer value generated by a user viewing a playback of the signal at the first level of quality as generated based on the first stream of reconstruction data;

producing a second stream of reconstruction data to include sets of reconstruction data to reconstruct the signal starting at the location as specified by the pointer value, the second stream of reconstruction data providing supplemental reconstruction data with respect to the first stream of reconstruction data and indicating how to modify a rendition of the signal generated based on the first stream of reconstruction data to reconstruct the signal starting at the location as specified by the pointer value according to the second level of quality; and

transmitting the second stream of reconstruction data to the decoder to enable play back, at the second level of quality, of portions of the signal following the location as specified by the pointer value.

12. The method as in claim 1 further comprising:

varying the level of quality of the reconstruction data to facilitate playback of the signal in substantially real-time by the decoder, according to the desired playback speed.

13. The method as in claim 1 further comprising:

implementing a fee schedule or a royalty schedule in which charged fees/royalties depend on a level of quality of the reconstruction data transmitted to the decoders.

14. The method as in claim 1 further comprising:

encoding the reconstruction data to include a first stream of reconstruction data and a second set of reconstruction data, the first stream of reconstruction data configured to enable reconstruction of the signal up to a first level of quality in the hierarchy, the second stream of reconstruction data configured to enable reconstruction of the signal up to a second level of quality in the hierarchy, the second level of quality higher than the first level of quality;

wherein the second stream of reconstruction data is supplemental reconstruction data indicating adjustments to make to the signal at the first level of quality as generated based on the first stream of reconstruction data in order to reconstruct the signal according to the second level of quality; and

implementing encryption and/or digital rights management with respect to only either the first or the second stream of reconstruction data to prevent unauthorized decoding of that stream of reconstruction data.

15. The method as in claim 1 further comprising:

encoding the reconstruction data to include a first stream of reconstruction data and a second stream of reconstruction data, the first stream of reconstruction data configured to enable reconstruction of the signal according to a first level of quality in the hierarchy, the second stream of reconstruction data configured to enable reconstruction of the signal according to a second level of quality in the hierarchy, the second level of quality higher than the first level of quality;

wherein the second stream of reconstruction data is supplemental reconstruction data indicating adjustments to make to the signal at the first level of quality as generated based on the first stream of reconstruction data in order to reconstruct the signal according to the second level of quality;

generating the first stream of reconstruction data to include redundant

encoding and/or transmission with guaranteed delivery to enable playback of the signal according to the first level of quality in the event of an error with respect to the first stream of reconstruction data; and

generating the second stream of reconstruction data to include non-redundant encoding and/or transmission with no guaranteed delivery.

16. The method as in claim 1, wherein the signal is a video signal and the reconstruction data is parsed into sets of reconstruction data encoded in a tiered hierarchy of levels of quality, each of the sets of reconstruction data indicating how to reconstruct at a given level of quality a respective tile of continguous elements associated with a portion of one or more images/frames of the video signal.

17. The method as in claim 16, wherein sets of reconstruction data are combined into multiple sequences, and transmitting sequences of the reconstruction data to the decoder includes:

transmitting each of the multiple sequences in sequential order, one complete sequence after another, in a bit stream to the decoder; and

providing marker information in the bit stream to indicate a respective beginning and end of each complete sequence of sets of tiered reconstruction data.

18. The method as in claim 1, wherein transmitting reconstruction data to the decoder includes:

providing marker information in the bit stream to indicate a respective beginning and end of tiered reconstruction data for each level of quality and for each portion of the signal.

19. The method as in claim 1, wherein transmitting sets of the reconstruction data to a decoder further comprises:

varying a highest level of quality of reconstruction data transmitted to the decoder for each portion of the signal in order to transmit a substantially constant bit rate of tiered reconstruction data to the decoder for each portion of multiple successive portions of the signal.

20. The method as in claim 1 further comprising:

partitioning a data stream into multiple segments including at least a first segment and a second segment, the first segment including reconstruction data to playback a first portion of the signal, wherein the first portion of the signal is an image/frame, the second segment including reconstruction data to playback a second portion of the signal, wherein the second portion of the signal includes a set of at least one subsequent images/frames;

populating the first segment of the data stream to include multiple levels of quality of reconstruction data to reconstruct the first portion of the signal at a first level of quality; and

populating the second segment of the data stream to include: i) multiple levels of quality of reconstruction data to reconstruct the second portion of the signal, and ii) at least one set of reconstruction data to reconstruct the first portion of the signal at a second level of quality, the second level of quality higher than the first level of quality.

21. The method as in claim 1, wherein the decoder decodes a video signal with an associated audio signal, and transmitting portions of the reconstruction data to a decoder further comprises:

combining reconstruction data of a video signal with the reconstruction data of an audio signal associated with the video signal;

varying a level of quality of the reconstruction data for the video signal and/or for the audio signal that are retrieved, combined into a single stream and transmitted to the decoder.

22. A method for managing adaptive decoding of reconstruction data in a decoder device that processes sets of reconstruction data retrieved from a repository, wherein sets of reconstruction data are encoded in accordance with a tiered hierarchy including multiple levels of quality, wherein a set of reconstruction data corresponding to a first encoded signal specifies to the decoder how to reconstruct a portion of a rendition of the first signal at a given level of quality based on a reconstructed rendition of a portion of the first signal at a lower level

of quality and independently of any reconstructed rendition of other portions of the first signal at the given level of quality, the method comprising:

starting signal reconstruction and playback according to a first level of quality;

receiving an indication that a user action modified playback settings for the signal;

varying a level of quality of signal reconstruction and playback.

23. A method as in claim 22, wherein varying a level of quality of signal reconstruction and playback comprises varying an amount of sets of reconstruction data that are retrieved from the repository and processed by the decoder for each rendition of the signal that is being played back.

24. A method as in claim 22, wherein the repository is in one or more server devices, connected to the decoder device via a network, and each set of reconstruction data is characterized by a unique identifier.

25. A method as in claim 22, wherein the user action comprises slowing down and/or pausing playback, and varying a level of quality comprises increasing the level of quality of signal reconstruction and playback for the portion of the signal that is being played back at slower speed or in pause.

26. A method as in claim 22, wherein the user action comprises zooming the rendition of the signal being played back, and varying a level of quality comprises increasing the level of quality of signal reconstruction and playback for a portion of the signal.

27. A method for managing adaptive decoding of reconstruction data in a decoder that processes sets of reconstruction data of one or more volumetric signals retrieved from a repository, wherein sets of reconstruction data are encoded in accordance with a tiered hierarchy including multiple levels of quality, wherein a set of reconstruction data corresponding to a first encoded signal specifies to the decoder how to reconstruct a portion of a rendition of the first signal at a given level of quality based on a reconstructed rendition of a portion of the first signal at

a lower level of quality and independently of any reconstructed rendition of other portions of the first signal at the given level of quality, the method comprising:

starting signal reconstruction and rendering of a first signal according to a first level of quality;

receiving an indication of modified rendering requirements for a portion of the first signal;

varying a level of quality of signal reconstruction and rendering.

28. Computer-readable storage hardware having instructions stored thereon, the instructions, when carried out by a processing device, causing the processing device to perform operations of:

determining a transmission bit rate and/or a highest level of quality expected to be supported by a decoder for the network connection;

retrieving reconstruction data from a repository, wherein the repository comprises one or more encoded signals, each encoded signal including a plurality of identified sets of reconstruction data encoded in accordance with a tiered hierarchy including multiple levels of quality, wherein a set of reconstruction data corresponding to a first encoded signal specifies to a decoder how to reconstruct a portion of a rendition of the first signal at a given level of quality based on a reconstructed rendition of a portion of the first signal at a lower level of quality and independently of any reconstructed rendition of other portions of the first signal at the given level of quality;

transmitting the retrieved reconstruction data to the decoder, the decoder configured to reconstruct renditions of a signal based on the transmitted reconstruction data; and

during the transmitting, updating the transmission bit rate and/or the highest level of quality expected to be supported by the decoder and varying a level of quality of the reconstruction data retrieved and transmitted to the decoder.

29. A computer system comprising:

a processor;

a memory unit that stores instructions associated with an application executed by the processor; and

an interconnect coupling the processor and the memory unit, enabling the computer system to execute the application and perform operations of:

determining a transmission bit rate and/or a highest level of quality expected to be supported by a decoder for the network connection;

retrieving reconstruction data from a repository, wherein the repository comprises one or more encoded signals, each encoded signal including a plurality of identified sets of reconstruction data encoded in accordance with a tiered hierarchy including multiple levels of quality, wherein a set of reconstruction data corresponding to a first encoded signal specifies to a decoder how to reconstruct a portion of a rendition of the first signal at a given level of quality based on a reconstructed rendition of a portion of the first signal at a lower level of quality and independently of any reconstructed rendition of other portions of the first signal at the given level of quality;

transmitting the retrieved reconstruction data to the decoder, the decoder configured to reconstruct renditions of a signal based on the transmitted reconstruction data; and

during the transmitting, updating the transmission bit rate and/or the highest level of quality expected to be supported by the decoder and varying a level of quality of the reconstruction data retrieved and transmitted to the decoder.

CLAIMS

1. A method comprising:

retrieving reconstruction data from a repository, the retrieved reconstruction data encoded in accordance with a tiered hierarchy including multiple levels of quality;

transmitting the retrieved reconstruction data to a decoder, the decoder configured to reconstruct renditions of a signal based on the transmitted reconstruction data; and

during the transmitting, varying a level of quality of the reconstruction data retrieved and transmitted to the decoder.

2. The method as in claim 1, wherein varying the level of quality includes:

transmitting a first set of reconstruction data to the decoder for play back of a first portion of the signal, the first set of reconstruction data indicating how to reconstruct a rendition of the first portion of the signal up to a first level of quality in the tiered hierarchy; and

transmitting a second set of reconstruction data to the decoder for play back of a second portion of the signal, the second set of reconstruction data indicating how to reconstruct a rendition of the second portion of the signal up to a second level of quality in the tiered hierarchy.

3. The method as in claim 2, wherein the first level of quality is higher than the second level of quality; and

wherein the second set of reconstruction data is transmitted at the second level of quality instead of the first level of quality in response to detecting the bandwidth currently available in a transmission channel.

4. The method as in claim 2, wherein the second set of reconstruction data is transmitted at the second level of quality in response to receiving a request to transmit the second set of reconstruction data at the second level of quality instead of the first level of quality.

5. The method as in claim 2, wherein the second set of reconstruction data is transmitted at the second level of quality in response to detecting a characteristic of the decoding resource.

6. The method as in claim 1, wherein each of multiple levels of quality of the reconstruction data for a image/frame of the signal indicates how to reconstruct a rendition

of the signal in accordance with a different level of quality.

7. The method as in claim 1, wherein varying the level of quality includes:

for a first portion of the signal, producing a first set of reconstruction data to include a sequence of reconstruction data from a lowest level of quality in the hierarchy to the first level of quality;

transmitting the first set of reconstruction data to the decoder for play back of the first portion of the signal in accordance with the first level of quality;

for a second portion of the signal, producing a second set of reconstruction data to include a sequence of reconstruction data from the lowest level of quality in the hierarchy to the second level of quality, the second level of quality being different than the first level of quality; and

transmitting the second set of reconstruction data to the decoder for play back of the second portion of the signal in accordance with the second level of quality.

8. The method as in claim 1, wherein varying the level of quality of the reconstruction data transmitted to the decoder includes:

producing a first set of reconstruction data to include reconstruction data to reconstruct portions of the signal in accordance with a first level of quality in the hierarchy;

transmitting the first set of reconstruction data to the decoder to enable play back and navigation amongst the signal in accordance with the first level of quality;

producing a second set of reconstruction data to include reconstruction data to reconstruct the signal in accordance with a second level of quality in the hierarchy; and

subsequent to transmitting the first set of reconstruction data, transmitting the second set of reconstruction data to the decoder for play back of the signal in accordance with the second level of quality.

9. The method as in claim 8, wherein the second set of reconstruction data is supplemental reconstruction data with respect to the first set of reconstruction data, the second set of reconstruction data indicating how to modify a rendition of the signal generated based on the first set of reconstruction data to reconstruct the signal according to the second level of quality.

10. The method as in claim 1, wherein varying the level of quality of the reconstruction

data transmitted to the decoder includes:

producing a first set of reconstruction data to reconstruct the signal in accordance with a first level of quality in the hierarchy;

transmitting the first set of reconstruction data to the decoder to enable navigation amongst the signal played back at the first level of quality;

receiving a pointer value indicating a location in the signal, the pointer value generated by a user viewing a playback of the signal at the first level of quality as generated based on the first set of reconstruction data;

producing a second set of reconstruction data to include reconstruction data to reconstruct the signal starting at the location as specified by the pointer value, the second set of reconstruction data encoded in accordance with a second level of quality in the hierarchy; and

transmitting the second set of reconstruction data to the decoder to enable play back, at the second level of quality, of portions of the signal following the location as specified by the pointer value.

11. The method as in claim 9, wherein the second set of reconstruction data is supplemental reconstruction data with respect to the first set of reconstruction data, the second set of reconstruction data indicating how to modify a rendition of the signal generated based on the first set of reconstruction data to reconstruct the signal starting at the location as specified by the pointer value according to the second level of quality.

12. The method as in claim 1 further comprising:

varying the level of quality of the reconstruction data to facilitate playback of the signal in substantially real-time by the decoder .

13. The method as in claim 1 further comprising:

implementing a fee schedule or a royalty schedule in which users are charged different fees/royalties depending on a level of quality of the reconstruction data transmitted to the decoders.

14. The method as in claim 1 further comprising:

encoding the reconstruction data to include a first set of reconstruction data and a second set of reconstruction data, the first set of reconstruction data configured to enable

reconstruction of the signal up to a first level of quality in the hierarchy, the second set of reconstruction data configured to enable reconstruction of the signal up to a second level of quality in the hierarchy, the second level of quality higher than the first level of quality;

wherein the second set of reconstruction data is supplemental reconstruction data indicating adjustments to make to the signal at the first level of quality as generated based on the first set of reconstruction data in order to reconstruct the signal according to the second level of quality; and

implementing digital rights management with respect to only the first set of reconstruction data to prevent unauthorized decoding of the first set of reconstruction data.

15. The method as in claim 1 further comprising:

encoding the reconstruction data to include a first set of reconstruction data and a second set of reconstruction data, the first set of reconstruction data configured to enable reconstruction of the signal according to a first level of quality in the hierarchy, the second set of reconstruction data configured to enable reconstruction of the signal according to a second level of quality in the hierarchy, the second level of quality higher than the first level of quality;

wherein the second set of reconstruction data is supplemental reconstruction data indicating adjustments to make to the signal at the first level of quality as generated based on the first set of reconstruction data in order to reconstruct the signal according to the second level of quality;

generating the first set of reconstruction data to include redundant encoding to enable playback of the first set of reconstruction data in the event of an error with respect to the first set of reconstruction data; and

generating the second set of reconstruction data to include non-redundant encoding.

16. The method as in claim 1, wherein the reconstruction data is parsed into groupings of reconstruction data, each of the groupings of reconstruction data representing a time-based portion of the signal, each of the groupings of reconstruction data including segments of tiered reconstruction data; and

wherein each of the segments of tiered reconstruction data indicates reconstruction data at a given level of quality for a respective tile of contiguous elements

associated with the signal.

17. The method as in claim 16, wherein transmitting portions of the reconstruction data to the decoder includes:

transmitting each of the multiple sequences in sequential order, one complete sequence after another, in a bit stream to the decoder; and

providing marker information in the bit stream to indicate a respective beginning and end of each complete sequence of segment of tiered reconstruction data.

18. The method as in claim 16, wherein transmitting portions of the reconstruction data to the decoder includes:

transmitting the tiered reconstruction data in a bit stream starting from reconstruction data from the multiple sequences for the lower levels of quality to reconstruction data from the multiple sequences for the higher level of quality for the multiple sequences;

providing marker information in the bit stream to indicate a respective beginning and end of tiered reconstruction data for each level of quality and for each sequence.

19. The method as in claim 1, wherein transmitting portions of the reconstruction data to a decoder further comprises:

varying a highest level of quality of reconstruction data transmitted to the decoder for each portion of the signal in order to transmit a substantially constant bit rate of tiered reconstruction data to the decoder for each portion of multiple successive portions of the signal.

20. The method as in claim 1 further comprising:

partitioning a data stream into multiple segments including at least a first segment and a second segment, the first segment including reconstruction data to playback a first portion of the signal, wherein the first portion of the signal is an image/frame, the second segment including reconstruction data to playback a second portion of the signal, wherein the second portion of the signal includes a set of at least one subsequent images/frames;

populating the first segment of the data stream to include multiple levels of quality of reconstruction data to reconstruct the first portion of the signal; and

populating the second segment of the data stream to include: i) multiple levels of quality of reconstruction data to reconstruct the second portion of the signal, and ii) at least one level

of quality of reconstruction data to reconstruct the first portion of the signal.

21. The method as in claim 20, wherein the decoder is configured to buffer the data stream and reconstruct the first portion of the signal based on the multiple levels of quality of reconstruction data in the first segment and the at least one level of quality of reconstruction data in the second segment.

22. The method as in claim 20, wherein the first portion of the signal is an I-frame (Intra frame) and the second portion includes one or more P-frames (Predicted frames).

23. The method as in claim 22, wherein the decoder reconstructs the rendition of the second portion of the signal and of the subsequent portions of the signal also based on the additional reconstruction data pertaining to the first portion of the signal contained in the second segment.

24. Computer-readable storage hardware having instructions stored thereon, the instructions, when carried out by a processing device, causing the processing device to perform operations of:

retrieving reconstruction data from a repository, the retrieved reconstruction data encoded in accordance with a tiered hierarchy including multiple levels of quality;

transmitting the retrieved reconstruction data to a decoder, the decoder configured to reconstruct renditions of a signal based on the transmitted reconstruction data; and

during the transmitting, varying a level of quality of the reconstruction data retrieved and transmitted to the decoder.

25. A computer system comprising:

a processor;

a memory unit that stores instructions associated with an application executed by the processor; and

an interconnect coupling the processor and the memory unit, enabling the computer system to execute the application and perform operations of:

retrieving reconstruction data from a repository, the retrieved reconstruction data encoded in accordance with a tiered hierarchy including multiple levels of quality;

transmitting the retrieved reconstruction data to a decoder, the decoder configured to reconstruct renditions of a signal based on the transmitted reconstruction data; and

during the transmitting, varying a level of quality of the reconstruction data retrieved and transmitted to the decoder.