Claims

1. Audio decoder device for decoding a bitstream ~~(BS)~~, the audio decoder device ~~(1)~~ comprising:

a predictive decoder ~~(2)~~ for producing a decoded audio frame ~~(AF)~~ from the bitstream ~~(BS)~~, wherein the predictive decoder ~~(2)~~ comprises a parameter decoder ~~(3)~~ for producing one or more audio parameters ~~(AP)~~ for the decoded audio frame ~~(AF)~~ from the bitstream ~~(BS)~~ and wherein the predictive decoder ~~(2)~~ comprises a synthesis filter device ~~(4)~~ for producing the decoded audio frame ~~(AF)~~ by synthesizing the one or more audio parameters ~~(AP)~~ for the decoded audio frame ~~(AF)~~;

a memory device ~~(5)~~ comprising one or more memories ~~(6; 6a, 6b, 6c)~~, wherein each of the memories ~~(6; 6a, 6b, 6c)~~ is configured to store a memory state ~~(MS; AMS, SMS, DMS)~~ for the decoded audio frame ~~(AF)~~, wherein the memory state ~~(MS; AMS, SMS, DMS)~~ for the decoded audio frame ~~(AF)~~ of the one or more memories ~~(6; 6a, 6b, 6c)~~ is used by the synthesis filter device ~~(4)~~ for synthesizing the one or more audio parameters ~~(AP)~~ for the decoded audio frame ~~(AF)~~; and

a memory state resampling device ~~(10)~~ configured to determine the memory state ~~(MS; AMS, SMS, DMS)~~ for synthesizing the one or more audio parameters ~~(AP)~~ for the decoded audio frame ~~(AF)~~, which has a sampling rate ~~(SR)~~, for one or more of said memories ~~(6; 6a, 6b, 6c)~~ by resampling a preceding memory state ~~(PMS; PAMS, PSMS, PDMS)~~ for synthesizing one or more audio parameters for a preceding decoded audio frame ~~(PAF)~~, which has a preceding sampling rate ~~(PSR)~~ being different from the sampling rate ~~(SR)~~ of the decoded audio frame ~~(AF)~~, for one or more of said memories ~~(6; 6a, 6b, 6c)~~ and to store the memory state ~~(MS; AMS, SMS, DMS)~~ for synthesizing of the one or more audio pa-

rameters ~~(AP)~~ for the decoded audio frame ~~(AF)~~ for one or more of said memories ~~(6; 6a, 6b, 6c)~~ into the respective memory ~~(6; 6a, 6b, 6c)~~.

2. Audio decoder device according to the preceding claim, wherein the one or more memories comprise ~~(6; 6a, 6b, 6c)~~ an adaptive codebook memory ~~(6a)~~ configured to store an adaptive codebook memory state ~~(AMS)~~ for determining one or more excitation parameters ~~(EP)~~ for the decoded audio frame ~~(AF)~~, wherein the memory state resampling device ~~(10)~~ is configured to determine the adaptive codebook memory state ~~(AMS)~~ for determining the one or more excitation parameters ~~(EP)~~ for the decoded audio frame ~~(AF)~~ by resampling a preceding adaptive codebook memory state ~~(PAMS)~~ for determining of one or more excitation parameters for the preceding decoded audio frame ~~(PAF)~~ and to store the adaptive codebook memory state ~~(AMS)~~ for determining of the one or more excitation parameters ~~(EP)~~ for the decoded audio frame ~~(AF)~~ into the adaptive codebook memory ~~(6a)~~.

3. Audio decoder device according to one of the preceding claims, wherein the one or more memories ~~(6; 6a, 6b, 6c)~~ comprise a synthesis filter memory ~~(6b)~~ configured to store a synthesis filter memory state ~~(SMS)~~ for determining one or more synthesis filter parameters ~~(SP)~~ for the decoded audio frame ~~(AF)~~, wherein the memory state resampling device ~~(1)~~ is configured to determine the synthesis filter memory state ~~(SMS)~~ for determining the one or more synthesis filter parameters ~~(SP)~~ for the decoded audio frame ~~(AF)~~ by resampling a preceding synthesis memory state ~~(PSMS)~~ for determining of one or more synthesis filter parameters for the preceding decoded audio frame ~~(PAF)~~ and to store the synthesis memory state ~~(SMS)~~ for determining of the one or more synthesis filter parameters ~~(SP)~~ for the decoded audio frame ~~(AF)~~ into the synthesis filter memory ~~(6b)~~.

4. Audio decoder device according to claim 3, wherein the memory resampling device ~~(10)~~ is configured in such way that the same synthesis filter parameters ~~(SP)~~ are used for a plurality of subframes of the decoded audio frame ~~(AF)~~.

5. Audio decoder device according to claim 3 or 4, wherein the memory resampling device ~~(10)~~ is configured in such way that the resampling of the preceding synthesis filter memory state ~~(PSMS)~~ is done by transforming the preceding synthesis filter memory state ~~(PSMS)~~ for the preceding decoded audio frame ~~(PAF)~~ to a power spectrum and by resampling the power spectrum.

6. Audio decoder device according to one of the preceding claims, wherein the one or more memories ~~(6; 6a, 6b, 6c)~~ comprise a de-emphasis memory ~~(6c)~~ configured to store a de-emphasis memory state ~~(DMS)~~ for determining one or more de-emphasis parameters ~~(DP)~~ for the decoded audio frame ~~(AF)~~, wherein the memory state resampling device ~~(10)~~ is configured to determine the de-emphasis memory state ~~(DMS)~~ for determining the one or more de-emphasis parameters ~~(DP)~~ for the decoded audio frame ~~(AF)~~ by resampling a preceding de-emphasis memory state ~~(PDMS)~~ for determining of one or more de-emphasis parameters for the preceding decoded audio frame ~~(PAF)~~ and to store the de-emphasis memory state ~~(DMS)~~ for determining of the one or more de-emphasis parameters ~~(DP)~~ for the decoded audio frame ~~(AF)~~ into the de-emphasis memory ~~(6c)~~.

7. Audio decoder device according to one of the preceding claims, wherein the one or more memories ~~(6; 6a, 6b, 6c)~~ are configured in such way that a number of stored samples for the decoded audio frame ~~(AF)~~ is proportional to the sampling rate ~~(SR)~~ of the decoded audio frame ~~(AF)~~.

8. Audio decoder device according to one of the preceding claims, wherein the memory state resampling device ~~(10)~~ is configured in such way that the resampling is done by linear interpolation.

9. Audio decoder device according to one of the preceding claims, wherein the memory state resampling device ~~(10)~~ is configured to retrieve the preceding memory state ~~(PMS; PAMS, PSMS, PDMS)~~ for one or more of said memories ~~(6; 6a, 6b, 6c)~~ from the memory device ~~(5)~~.

10. Audio decoder device according to one of the preceding claims, wherein the audio decoder device ~~(1)~~ comprises an inverse-filtering device ~~(17)~~ configured for inverse-filtering of the preceding decoded audio frame ~~(PAF)~~ at the preceding sampling rate ~~(PSR)~~ in order to determine the preceding memory state ~~(PMS; PAMS, PSMS, PDMS)~~ of one or more of said memories ~~(6; 6a, 6b, 6c)~~, wherein the memory state resampling device is configured to retrieve the preceding memory state for one or more of said memories from the inverse-filtering device.

11. Audio decoder device according to one of the preceding claims, wherein the memory state resampling device is configured to retrieve the preceding memory state ~~(PMS; PAMS, PSMS, PDMS)~~ for one or more of said memories ~~(6; 6a, 6b, 6c)~~ from a further audio processing device ~~(26)~~.

12. Method for operating an audio decoder device ~~(1)~~ for decoding a bitstream ~~(BS)~~, the method comprising the steps of:

producing a decoded audio frame ~~(AF)~~ from the bitstream ~~(BS)~~ using a predictive decoder ~~(2)~~, wherein the predictive decoder ~~(2)~~ comprises a parameter decoder ~~(3)~~ for producing one or more audio parameters ~~(AP)~~ for the decoded audio frame ~~(AF)~~ from the bitstream ~~(BS)~~ and wherein the predictive decoder ~~(2)~~ comprises a synthesis filter device ~~(4)~~ for producing the decoded audio frame ~~(AF)~~ by synthesizing the one or more audio pa-

rameters ~~(AP)~~ for the decoded audio frame ~~(AF)~~;

providing a memory device ~~(5)~~ comprising one or more memories ~~(6; 6a, 6b, 6c)~~, wherein each of the memories ~~(6; 6a, 6b, 6c)~~ is configured to store a memory state ~~(MS; AMS, SMS, DMS)~~ for the decoded audio frame ~~(AF)~~, wherein the memory state ~~(MS; AMS, SMS, DMS)~~ for the decoded audio frame ~~(AF)~~ of the one or more memories ~~(6; 6a, 6b, 6c)~~ is used by the synthesis filter device ~~(4)~~ for synthesizing the one or more audio parameters ~~(AP)~~ for the decoded audio frame ~~(AF)~~;

determining the memory state ~~(MS; AMS, SMS, DMS)~~ for synthesizing the one or more audio parameters ~~(AP)~~ for the decoded audio frame ~~(AF)~~, which has a sampling rate ~~(SR)~~, for one or more of said memories ~~(6; 6a, 6b, 6c)~~ by resampling a preceding memory state ~~(PMS; PAMS, PSMS, PDMS)~~ for synthesizing one or more audio parameters for a preceding decoded audio frame ~~(PAF)~~, which has a preceding sampling rate ~~(PSR)~~ being different from the sampling rate ~~(SR)~~ of the decoded audio frame ~~(AF)~~, for one or more of said memories ~~(6; 6a, 6b, 6c)~~; and

storing the memory state ~~(MS; AMS, SMS, DMS)~~ for synthesizing of the one or more audio parameters ~~(AP)~~ for the decoded audio frame ~~(AF)~~ for one or more of said memories ~~(6; 6a, 6b, 6c)~~ into the respective memory.

13. Computer program, when running on a processor, executing the method according to the preceding claim.

14. Audio encoder device for encoding a framed audio signal ~~(FAS)~~, the audio encoder device ~~(27)~~ comprising:

a predictive encoder ~~(28)~~ for producing an encoded audio frame ~~(EAF)~~ from the framed audio signal ~~(FAS)~~, wherein the predictive encoder ~~(28)~~ comprises a parameter analyzer ~~(29)~~ for producing one or more audio pa-

rameters (AP) for the encoded audio frame (EAV) from the framed audio signal (FAS) and wherein the predictive encoder (28) comprises a synthesis filter device (4) for producing a decoded audio frame (AF) by synthesizing one or more audio parameters (AP) for the decoded audio frame (AF), wherein the one or more audio parameters (AP) for the decoded audio frame (AF) are the one or more audio parameters (AP) for the encoded audio frame (EAV);

a memory device (5) comprising one or more memories (6; 6a, 6b, 6c), wherein each of the memories (6; 6a, 6b, 6c) is configured to store a memory state (MS; AMS, SMS, DMS) for the decoded audio frame (AF), wherein the memory state (MS; AMS, SMS, DMS) for the decoded audio frame (AF) of the one or more memories (6; 6a, 6b, 6c) is used by the synthesis filter (4) device for synthesizing the one or more audio parameters (AP) for the decoded audio frame (AF); and

a memory state resampling device (10) configured to determine the memory state (MS; AMS, SMS, DMS) for synthesizing the one or more audio parameters (AP) for the decoded audio frame (AF), which has a sampling rate (SR), for one or more of said memories (6; 6a, 6b, 6c) by resampling a preceding memory state (PMS; PAMS, PSMS, PDMS) for synthesizing one or more audio parameters for a preceding decoded audio frame (PAF), which has a preceding sampling rate (PSR) being different from the sampling rate (SR) of the decoded audio frame (AF), for one or more of said memories (6; 6a, 6b, 6c) and to store the memory state (MS; AMS, SMS, DMS) for synthesizing of the one or more audio parameters (AP) for the decoded audio frame (AF) for one or more of said memories (6; 6a, 6b, 6c) into the respective memory (6; 6a, 6b, 6c).

15. Audio encoder device according to the preceding claim, wherein the one or more memories (6; 6a, 6b, 6c) comprise an adaptive codebook memory (6a) configured to store an adaptive codebook state (AMS) for

determining one or more excitation parameters ~~(EP)~~ for the decoded audio frame ~~(AF)~~, wherein the memory state resampling device ~~(10)~~ is configured to determine the adaptive codebook state ~~(AMS)~~ for determining the one or more excitation parameters ~~(EP)~~ for the decoded audio frame ~~(AF)~~ by resampling a preceding adaptive codebook memory state ~~(PAMS)~~ for determining of one or more excitation parameters ~~(EP)~~ for the preceding decoded audio frame ~~(PAF)~~ and to store the adaptive codebook memory state ~~(AMS)~~ for determining of the one or more excitation parameters ~~(EP)~~ for the decoded audio frame ~~(AF)~~ into the adaptive codebook memory ~~(6a)~~.

16. Audio encoder device according to claim 14 or 15, wherein the one or more memories ~~(6; 6a, 6b, 6c)~~ comprise a synthesis filter memory ~~(6b)~~ configured to store a synthesis filter memory state ~~(SMS)~~ for determining one or more synthesis filter parameters ~~(SP)~~ for the decoded audio frame ~~(AF)~~, wherein the memory state resampling device ~~(10)~~ is configured to determine the synthesis memory state ~~(SMS)~~ for determining the one or more synthesis filter parameters ~~(SP)~~ for the decoded audio frame ~~(AF)~~ by resampling a preceding synthesis memory state ~~(PSMS)~~ for determining of one or more synthesis filter parameters for the preceding decoded audio frame ~~(PAF)~~ and to store the synthesis memory state ~~(SMS)~~ for determining of the one or more synthesis filter parameters ~~(SP)~~ for the decoded audio frame ~~(AF)~~ into the synthesis filter memory ~~(6b)~~.

17. Audio encoder device according to the preceding claim, wherein the memory state resampling device ~~(10)~~ is configured in such way that the same synthesis filter parameters ~~(SP)~~ are used for a plurality of subframes of the decoded audio frame ~~(AF)~~.

18. Audio encoder device according to claim 16 or 17, wherein the memory resampling device ~~(10)~~ is configured in such way that the resampling of the preceding synthesis filter memory state ~~(PSMS)~~ is done by transform-

ing the preceding synthesis filter memory state ~~(PSMS)~~ for the preceding decoded audio frame ~~(PAF)~~ to a power spectrum and by resampling the power spectrum.

19. Audio encoder device according to one of the claims 14 to 18, wherein the one or more memories ~~(6; 6a, 6b, 6c)~~ comprise a de-emphasis memory ~~(6c)~~ configured to store a de-emphasis memory state ~~(DMS)~~ for determining one or more de-emphasis parameters ~~(DP)~~ for the decoded audio frame ~~(AF)~~, wherein the memory state resampling device ~~(10)~~ is configured to determine the de-emphasis memory state ~~(DMS)~~ for determining the one or more de-emphasis parameters ~~(DP)~~ for the decoded audio frame ~~(AF)~~ by resampling a preceding de-emphasis memory state ~~(PDMS)~~ for determining of one or more de-emphasis parameters for the preceding decoded audio frame ~~(PAF)~~ and to store the de-emphasis memory state ~~(DMS)~~ for determining of the one or more de-emphasis parameters ~~(DP)~~ for the decoded audio frame ~~(AF)~~ into the de-emphasis memory ~~(6c)~~.

20. Audio encoder device according to one of the claims 14 to 19, wherein the one or more memories ~~(6; 6a, 6b, 6c)~~ are configured in such way that a number of stored samples for the decoded audio frame ~~(AF)~~ is proportional to the sampling rate ~~(SR)~~ of the decoded audio frame.

21. Audio encoder device according to one of the claims 14 to 20, wherein the memory resampling device ~~(10)~~ is configured in such way that the resampling is done by linear interpolation.

22. Audio encoder device according to one of the claims 14 to 21, wherein the memory state resampling device ~~(10)~~ is configured to retrieve the preceding memory state ~~(PMS; PAMS, PSMS, PDMS)~~ for one or more of said memories ~~(6; 6a, 6b, 6c)~~ from the memory device ~~(5)~~.

23. Audio encoder device according to one of the claims 14 to 22, wherein the audio encoder device ~~(27)~~ comprises an inverse-filtering device ~~(17)~~ configured for inverse-filtering of the preceding decoded audio frame ~~(PAF)~~ in order to determine the preceding memory state ~~(PMS; PAMS, PSMS, PDMS)~~ for one or more of said memories ~~(6; 6a, 6b, 6c)~~, wherein the memory state resampling device ~~(10)~~ is configured to retrieve the preceding memory state ~~(PMS; PAMS, PSMS, PDMS)~~ for one or more of said memories ~~(6; 6a, 6b, 6c)~~ from the inverse-filtering device ~~(17)~~.

24. Audio encoder device according to one of the claims 14 to 23, wherein the memory state resampling device ~~(10)~~ is configured to retrieve the preceding memory state ~~(PMS; PAMS, PSMS, PDMS)~~ for one or more of said memories ~~(6; 6a, 6b, 6c)~~ from of a further audio processing device.

25. Method for operating an audio encoder device ~~(27)~~ for encoding a framed audio signal, the method comprising the steps of:

producing an encoded audio frame ~~(EAF)~~ from the framed audio signal ~~(FAS)~~ using a predictive encoder ~~(28)~~, wherein the predictive encoder ~~(28)~~ comprises a parameter analyzer ~~(29)~~ for producing one or more audio parameters ~~(AP)~~ for the encoded audio frame ~~(EAF)~~ from the framed audio signal ~~(FAS)~~ and wherein the predictive encoder ~~(28)~~ comprises a synthesis filter device ~~(4)~~ for producing a decoded audio frame ~~(AF)~~ by synthesizing one or more audio parameters ~~(AP)~~ for the decoded audio frame, wherein the one or more audio parameters ~~(AP)~~ for the decoded audio frame ~~(AF)~~ are the one or more audio parameters ~~(AP)~~ for the encoded audio frame ~~(EAV)~~;

providing a memory device ~~(5)~~ comprising one or more memories ~~(6; 6a, 6b, 6c)~~, wherein each of the memories ~~(6; 6a, 6b, 6c)~~ is configured to store a memory state ~~(MS; AMS, SMS, DMS)~~ for the decoded audio frame ~~(AF)~~, wherein the memory state ~~(MS; AMS, SMS, DMS)~~ for the de-

coded audio frame ~~(AF)~~ of the one or more memories ~~(6; 6a, 6b, 6c)~~ is used by the synthesis filter device ~~(4)~~ for synthesizing the one or more audio parameters ~~(AP)~~ for the decoded audio frame ~~(AF)~~;

determining the memory state ~~(MS; AMS, SMS, DMS)~~ for synthesizing the one or more audio parameters ~~(AP)~~ for the decoded audio frame ~~(AF)~~, which has a sampling rate ~~(SR)~~, for one or more of said memories ~~(6; 6a, 6b, 6c)~~ by resampling a preceding memory state ~~(PMS; PAMS, PSMS, PDMS)~~ for synthesizing one or more audio parameters for a preceding decoded audio frame ~~(PAF)~~, which has a preceding sampling rate ~~(PSR)~~ being different from the sampling rate ~~(SR)~~ of the decoded audio frame ~~(AF)~~, for one or more of said memories ~~(6; 6a, 6b, 6c)~~; and

storing the memory state ~~(MS; AMS, SMS, DMS)~~ for synthesizing of the one or more audio parameters ~~(AP)~~ for the decoded audio frame ~~(AF)~~ for one or more of said memories ~~(6; 6a, 6b, 6c)~~ into the respective memory ~~(6; 6a, 6b, 6c)~~.

26. Computer program, when running on a processor, executing the method according to the preceding claim.