CLAIMS

1. A method of decoding video data, the method comprising:

determining a decoded syntax element by applying binary arithmetic decoding to an offset value included in a bitstream, wherein applying the binary arithmetic decoding comprises:

generating a bin stream, wherein generating the bin stream comprises:

for at least one respective bin of the bin stream:

determining a value of the respective bin based on a state for the respective bin, an interval for the respective bin, and the offset value;

determining one or more Finite State Machine (FSM) parameters for a next bin of the bin stream, the one or more FSM parameters for the next bin controlling how probability estimates for the next bin are computed from a state for the respective bin, the next bin of the bin stream following the respective bin in the bin stream; and

determining a state for the next bin of the bin stream using a parameterized state updating function that takes as input the state for the respective bin, the one or more FSM parameters for the next bin of the bin stream, and the value of the respective bin; and

debinarizing the bin stream to form the decoded syntax element; and

reconstructing a picture of the video data based in part on the decoded syntax element, characterised in that

determining the one or more FSM parameters for the next bin comprises, modifying the FSM parameters for the next bin based on a measure of past probability variation.

2. The method of claim 1, wherein determining the one or more FSM parameters for the next bin of the bin stream comprises:

reinitializing the FSM parameters for the next bin of the bin stream according to a state reinitialization parameter.

3. The method of claim 1, wherein determining the one or more FSM parameters for the next bin of the bin stream comprises:

modifying the FSM parameters for the next bin of the bin stream according to estimated probability values.

4. The method of claim 1, wherein the measure of past probability variation is computed by summing absolute differences between probabilities estimated using an estimation variation measure for the particular bin defined as:

$$\sigma[k+1] = \sigma[k] + \left\lfloor \frac{|q_1[k] - q_2[k]| - \sigma[k]}{2^c} \right\rfloor$$

where $\sigma[k+1]$ is the estimation variation measure for the next bin of the bin stream, $\sigma[k]$ is an estimation variation measure for the particular bin, $q_1[k]$ is a first probability estimate for the particular bin, $q_2[k]$ is a second probability estimate for the particular bin, and c is a parameter.

5. The method of claim 1, wherein determining the one or more FSM parameters for the next bin of the bin stream comprises:

determining the one or more FSM parameters for the next bin of the bin stream based on one or more neighboring blocks in the same frame or a previously decoded frame.

6. The method of claim 1, wherein, for each respective bin of the bin stream, determining the state for the next bin of the bin stream comprises:

determining the state for the next bin according to the following equations:

$$q_1[k+1] = q_1[k] + \left\lfloor \frac{2^{15} b[k] - q_1[k]}{2^a} \right\rfloor,$$

$$q_2[k+1] = q_2[k] + \left\lfloor \frac{2^{15} b[k] - q_2[k]}{2^b} \right\rfloor,$$

$$p[k+1] = \left\lfloor \frac{q_1[k+1] + q_2[k+1]}{2} \right\rfloor$$

where p[k+1] is the state for the next bin of the bin stream, p[k] is the state for the respective bin, b[k] is the value of the respective bin, a is a first parameter of the

one or more FSM parameters for the next bin, and b is a second parameter of the one or more FSM parameters for the next bin.

7. The method of claim 1, wherein, for each respective bin of the bin stream, determining the value of the respective bin comprises:

dividing, based on the state for the respective bin, the interval for the respective bin into an interval associated with a first symbol and an interval associated with a second symbol; and

determining the value of the respective bin based on whether the offset value is in the interval associated with the first symbol or the interval associated with the second symbol,

wherein the value of the respective bin is equal to the first symbol in response to determining the offset value is in the interval associated with the first symbol, and

wherein the value of the respective bin is equal to the second symbol in response to determining the offset value is in the interval associated with the second symbol.

8. The method of claim 1, further comprising receiving the bitstream.

9. The method of claim 1, wherein the one or more FSM parameters for a first bin of the bin stream are different from the one or more FSM parameters for a second bin of the bin stream.

10. A method of encoding video data, the method comprising:

generating a syntax element based on the video data;

determining an offset value at least in part by applying binary arithmetic encoding to the syntax element, wherein applying the binary arithmetic encoding comprises:

generating a bin stream at least in part by:

binarizing the syntax element;

for at least one respective bin of the bin stream:

determining an interval for a next bin of the bin stream based on a state for the respective bin, an interval for the respective bin, and a value of the respective bin;

determining one or more Finite State Machine (FSM) parameters for the next bin of the bin stream, the one or more FSM parameters for the next bin controlling how probability estimates for the next bin are computed from a state for the respective bin; and

determining a state for the next bin of the bin stream using a parameterized state updating function that takes as input the state for the respective bin, the one or more FSM parameters for the next bin of the bin stream, and the value of the respective bin,

wherein the offset value is equal to a value in the interval for a last bin of the bin stream; and

outputting a bitstream comprising the offset value;

characterised in that determining the one or more FSM parameters for the next bin comprises, modifying the FSM parameters for the next bin based on a measure of past probability variation.

11. An apparatus for decoding video data, the apparatus comprising:

one or more storage media configured to store video data; and

one or more processors configured to:

determine a decoded syntax element by applying binary arithmetic decoding to an offset value included in a bitstream, wherein the one or more processors are configured such that, as part of applying the binary arithmetic decoding, the one or more processors:

generate a bin stream, wherein, as part of generating the bin stream, the one or more processors:

for at least one respective bin of the bin stream:

determine a value of the respective bin based on a state for the respective bin, an interval for the respective bin, and the offset value;

determine one or more Finite State Machine (FSM) parameters for a next bin of the bin stream, the one or more FSM parameters for the next bin controlling how probability estimates for the next bin are computed from a state for the respective bin, the next bin of the bin stream following the respective bin in the bin stream; and

determine a state for the next bin of the bin stream using a parameterized state updating function that takes as input the state for the respective bin, the one or more FSM parameters for the next bin of the bin stream, and the value of the respective bin; and

debinarize the bin stream to form the decoded syntax element; and

reconstruct a picture of the video data based in part on the decoded syntax element;

characterised in that determining the one or more FSM parameters for the next bin comprises, modifying the FSM parameters for the next bin based on a measure of past probability variation.

12. An apparatus for encoding video data, the apparatus comprising:

one or more storage media configured to store video data; and

one or more processing circuits coupled to the one or more storage media, the one or more processing circuits configured to:

generate a syntax element based on the video data;

determine an offset value at least in part by applying binary arithmetic encoding to the syntax element, wherein the one or more processors are configured such that, as part of applying the binary arithmetic encoding, the one or more processors generate a bin stream at least in part by:

binarizing the syntax element; and

for at least one respective bin of the bin stream:

determine an interval for a next bin of the bin stream based on a state for the respective bin, an interval for the respective bin, and a value of the respective bin;

determine one or more Finite State Machine (FSM) parameters for the next bin of the bin stream, the one or more FSM parameters for the next bin controlling how probability estimates for the next bin are computed from a state for the respective bin; and

determine a state for the next bin of the bin stream using a parameterized state updating function that takes as input the state for the respective bin, the one or more FSM parameters for the next bin of the bin stream, and the value of the respective bin,

wherein the offset value is equal to a value in the interval for a last bin of the bin stream; and

output a bitstream comprising the offset value;

characterised in that determining the one or more FSM parameters for the next bin comprises, modifying the FSM parameters for the next bin based on a measure of past probability variation.

13. The apparatus of claim 12, wherein the one or more FSM parameters for a first bin of the bin stream are different from the one or more FSM parameters for a second bin of the bin stream.

14. The apparatus of claim 12, wherein the apparatus comprises:
an integrated circuit,
a microprocessor, or
a wireless communication device.

15. A computer-readable storage medium storing instructions that, when executed, cause one or more processors to perform the method of any one of claims 1 to 10.