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(54) **METHOD AND ARRANGEMENT FOR ARITHMETIC ENCODING AND DECODING BINARY STATES AND A CORRESPONDING COMPUTER PROGRAM AND A CORRESPONDING COMPUTER-READABLE STORAGE MEDIUM**

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(51) **Int. Cl.**[7] **H03M 7/00**

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(58) **Field of Search** 341/106, 107, 341/50, 65; 382/239

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(57) **ABSTRACT**

A method and arrangement for arithmetic encoding/decoding is described, wherein the probability estimation is performed by a finite state machine FSM, wherein the generation of N representative states of the FSM is performed offline. Corresponding transition rules are filed in the form of tables. In addition, a pre-quantization of the interval width R to a number of K pre-defined quantization values is carried out. With suitable dimensioning of K and N, this allows the generation of a table containing all K×N combinations of pre-calculated product values $R \times P_{LPS}$ for a multiplication-free determination of R_{LPS}. Overall, the result is a good compromise between high coding efficiency and low calculation effort.

63 Claims, 4 Drawing Sheets

1. Determination of the LPS
2. Calculation of the Variables R_{LPS} and R_{MPS} :

$$R_{LPS} = R \times P_{LPS}$$
$$R_{MPS} = R - R_{LPS}$$

3. Calculation of the new partial interval:

```
if (bit = LPS) then
        L ← L + R_MPS
        R ← R_LPS
else
        R ← R_MPS
```

4. Updating the probability estimation P_{LPS}
5. Outputting the bits and renormalizing R

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1. Determination of the LPS
2. Calculation of the Variables R_{LPS} and R_{MPS}:
   $R_{LPS} = R \times P_{LPS}$
   $R_{MPS} = R - R_{LPS}$
3. Calculation of the new partial interval:
   if (bit = LPS) then
   $L \leftarrow L + R_{MPS}$
   $R \leftarrow R_{LPS}$
   else
   $R \leftarrow R_{MPS}$
4. Updating the probability estimation P_{LPS}
5. Outputting the bits and renormalizing R

FIG. 1

1. Determination of the LPS
2. Quantization of R:
   q_index = Qtab[R>>q]
3. Determination of R_{LPS} and R_{MPS}:
   R_{LPS} = Rtab[q_index,p_state]
   $R_{MPS} = R - R_{LPS}$
4. Calculation of the new partial interval:
   if (bit = LPS) then
   $L \leftarrow L + R_{MPS}$
   $R \leftarrow R_{LPS}$
   p_state ← Next_State_LPS[p_state]
   else
   $R \leftarrow R_{MPS}$
   p_state ← Next_State_MPS[p_state]

FIG. 2

1. Determination of the LPS
2. Quantization of R:

```
q_index = Qtab[R>>q]
```

3. Determination of R_{LPS} and R_{MPS}:

```
R_LPS = Rtab[q_index,p_state]
R_MPS = R - R_LPS
```

4. Determination of bit, depending on the position of the partial interval:

```
if (V ≥ R_MPS) then
        bit ← LPS
        V ← V - R_MPS
        R ← R_LPS
        p_state ← Next_State_LPS[p_state]
else
        bit ← MPS
        R ← R_MPS
        p_state ← Next_State_MPS[p_state]
```

5. Renormalization of R, reading out a bit and updating V

FIG. 3

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