Description

The invention pertains to television information transmission and reception and more particularly to the transmission and reception of high definition television information.

Conventional color television systems transmit picture information at a rate of 59.94 picture fields per second, two constituting a frame, each frame consisting of 525 horizontal scan lines. To reduce the transmission and reception bandwidths required to reproduce the transmitted picture, these horizontal scan lines are interlaced from field-to-field with a ratio of two-to-one, that is only every other scan line is transmitted in each field. Scan lines omitted in one field are transmitted in the next succeeding field, thus all the odd numbered fields contain one set of scan lines and the even numbered fields contain the set of scan lines which interlace with the scan lines in the odd numbered fields. This arrangement permits the transmission, reception, and picture reproduction at bandwidths reduced from that required for every scan line to be transmitted in each field.

Television pictures reproduced in these conventional systems have aspect ratio of four to three, i.e. for every four units of horizontal width there are three units of vertical height. Thus, a picture tube 15 inches (one inch = 2.54 cm) on the diagonal has a width of 12 inches and a height of 9 inches, while a picture tube 19 inches on the diagonal has a width of 15.2 inches and a height of 11.4 inches.

The above specifications provide television pictures of good commercial quality which, however, degrade as the size of the picture tube increases. The graininess of the picture produced by the 2:1 interlace ratio is acceptable for small screen receivers, but becomes more apparent as the size of the picture tube increases. Consequently, as the television screen continue to increase in size the graininess becomes increasingly more unacceptable. To counteract this and provide greater picture resolution high definition television systems having increased aspect ratios and 1:1 progressive scans are presently under consideration.

In accordance with the principle of the present invention, digital data encoded from RGB high definition television signals are coupled to bit rate reducing circuitry wherein they are converted to digital signals at bit rates that are reduced from the bit rates of the input digital signals. The digital signals at the reduced bit rates are then coupled to a multiplexer which sequentially positions the input data and provides a multiplicity of digital data streams having equal bit rates. The equal bit rate data streams are then coupled to modulating circuitry, employing spread spectrum techniques, to modulate a carrier signal for transmission.

At a receiver the modulated carrier is demodulated and the equal bit rate data streams are reestablished. The equal bit rate data streams are then coupled to a demultiplexer where they are sequentially positioned and rearranged to provide the bit rate reduced data streams which are then coupled to a decoder, wherefrom digital data streams emerge that are representative of the digital data streams coupled to the input terminal of the transmitter.

Figure 1 is a representation of an augmented television picture screen showing thereon the left panel, the center panel, and the right panel.

Figure 2 is a block diagram of a transmitter of a preferred embodiment of the invention.

Figure 2a is a diagram showing the allocation of time to encoded signals over a four scan line interval.

Figure 2b is a block diagram of the transmitter of Figure 2 showing various bit rates of signals in the transmitter.

Figure 3a is a diagram of a differential pulse code modulator encoder.

Figure 3b is a block diagram of a differential pulse code modulator decoder.

Figure 4a is a diagram of a direct sequence encoder.

Figure 4b is a diagram of a direct sequence decoder.

Figures 5a, 5b, and 5c are spectral representations of finite pulse sequences useful in explaining the invention.

Figure 6 is a block diagram of a receiver of a preferred embodiment of the invention.

In a high definition television system there is a 1:1 sequential transmission of the scan lines in each frame and the frames are transmitted at a 59.94 Hz rate, in contrast to the 2:1 interlacing of fields which are transmitted at a 59.94 Hz rate on conventional television transmission. In addition, the aspect ratio of the picture is increased from 4:3 to 5.33:3 as shown in Figure 1, wherein the center panel 11 is representative of the conventional TV picture, while the left panel (LP) 12 and right panel (RP) 13 are added to increase the aspect ratio as shown in the Figure. The total scan time for each scan line remains constant from frame-to-frame, as does scan time allotted to the center panel, and the total scan time allotted to the left and right panels. Though the total scan time allotted to the left and right panels remains constant from frame-to-frame the distribution of this allotted time may vary from frame-to-frame depending upon the position of the center panel. The high definition television (HDTV) source signals provide the RGB color components with a 525 line progressive scan, a frame rate of 59.94 Hz, 16:9 aspect ratio, and a 16.8 MHz hori-

zontal bandwidth for luminance. As shown in Figure 2, these source signals and a synchronisation signal S are coupled to a HDTV encoder 15, which may be the encoder disclosed by Cavallerano, et al in US-A-4 999 701 entitled "High Definition NTSC Compatible Television System with Increased Horizontal Bandwidth and Reduced Color Artifacts", (PHA 21,411). The HDTV encoder 15 processes the source signals and provides a sum of the left panel data and the right panel data on an output 17, two line differential (LD) encoding signals, which are derived from every four source lines, on outputs 19 and 21, high frequency luminance (Yh) on output 23, and the chrominance signals (Ih, Qh) on outputs 25 and 27, respectively. A time budget for these signals over a four line encoding interval may be as shown in Figure 2a. As indicated in this figure the time intervals of the encoded signals, with the exception of the encoded LD2 and LD4 signals are mutually exclusive. These mutually exclusive time interval signals are coupled to the input terminals of the present invention for transmission. Further, a DSS (digital sync. & sound) and a C/S (control/sync) signal are provided by the HDTV encoder 15.

Signals at the output terminals of the HDTV encoder are coupled to a bit rate reduction unit 29 in the transmitter wherein each stream of digital data is converted to an analog signal in digital to analog (D/A) converters 31a through 31f. Analog signals established from the data streams at outputs 17, 19, and 21 are baseband signals which are coupled to low pass filters 33a-c, while luminance and chrominance analog signals derived from the data streams at outputs 23, 25, and 27 have bandwidths about a center frequency. These signals are coupled to filters 33d-f as baseband signals after being down converted in mixers 35a-c operating at a local oscillator (LO) frequency, an internally generated frequency for conversion purposes, its frequency value depending on and varying with the channel to be received or transmitted. The low pass filters 33a-f remove extraneous frequencies and serve as anti-aliasing filters for the reconversion of the analog signals to digital signals by the analog to digital (A/D) converters 37a-f wherefrom digital signals emerge at bit rates reduced from that of the bit rates at the output terminals of the HDTV encoder 15. These bit rates, as well as reduced bit rates mentioned below can be found in Fig. 2b. Additional bit rate reduction is achieved by coupling the reduced bit rate data streams from the A/D converters to differential pulse code modulators 39a-f (DPCM) wherefrom a digital signal representative of the difference between the actual digital data sample and a predicted sample for that data is provided.

Each input value V(i) to the DPCM is compared with a predicted value V(p) which is based on the history of the input data. This history is accumulated over many cycles of the highly redundant video image and may be provided in three dimensions; two spatial and one temporal. For example, pixel values in the horizontal and vertical directions and corresponding values from consecutive frames are combined to yield the initial value V(p). DPCM systems and the generation of predictive values are taught in the article "DPCM Picture Coding With Adaptive Prediction" IEEE Transactions on Communications, No. 11, Nov. 1977, by Wilmut Zschunke, predictors being discussed on page 1295. This article is incorporated by reference into the present application. The difference V(d) between V(i) and V(p) is provided by a difference circuit 41 and coupled to a non-linear quantizer 43 shown in Figure 3a. Non-linear quantizer 43 has a non-linear input-output characteristic and a limited number of output values. This non-linear characteristic is based on the human eye's greater sensitivity to luminance/chrominance errors in fields exhibiting small or no changes in luminance/chrominance, than it is to errors in fields exhibiting large luminance/chrominance changes. The number and size of the quantitization steps are made functions of the value V(d), each increasing with the value of V(d). The output of the quantizer 43 is coupled to the output terminal of DPCM and to a sum circuit 45 wherein it is added to the previous predicted value from an n-dimensional predictor 47 and the sum, so produced, provided to the predictor 47 as a new prediction value.

Figure 3b is a diagram of a circuit for recovering the actual digital sample value from the differential value. DPCM data is coupled to a sum circuit 49 wherein it is added to the previously determined predicted value in an n-dimensional predictor 51. Sums resulting from this addition are coupled to the output terminal of the decoder and to the predictor 51 as an updated prediction.

Turning back now to Figure 2, six data streams with varying bit rates and mutually exclusive time intervals, with the exception of the data streams representative of the LD2 and the LD4 data from HDTV encoder 15 are coupled from the bit rate reducer 29 to a multiplexer/buffer memory 53. After a suitable delay of either the LD2 or LD4 data stream to provide a totality of mutually exclusive time intervals the data bit streams are sequentially stored in the memory of the multiplexer/buffer memory 53 wherein they are divided into N data streams of equal length and equal bit rate which are respectively and simultaneously coupled to N direct sequence encoders (DSE) 55-1 to 55-N.

A modulo-2 addition is performed on the low bit-rate streams by the DSE to provide a code

sequence at a predetermined increased bit rate for each of the data streams emanating from the multiplexer/buffer memory 53. A circuit for accomplishing this bit rate conversion is shown in Figure 4a. A pseudo-noise sequence generator 57 (PNSG) having a sequence rating at the desired conversion bit rate is coupled to one terminal of an exclusive OR gate 59, the other terminal of which is coupled to receive the data stream. Exclusive OR gate 59 provides an encoded data stream at a bit rate determined by the bit rate of the pseudo noise sequence generator 59. Only a small percentage of the possible codes that may be generated by the PNSG are utilized to achieve a code repetition rate equal to the TV frame repetition rate. Each code has a defined start point synchronized to the TV frame start. Of all the possible codes available from the PNSG 57 only N codes are chosen and their start points are defined such that each source bit to be transmitted is represented by a unique sequence within the repetition time of the code sequences. For a 200K bit/sec data rate, as in a preferred embodiment of the invention, a 6M bit/sec rate for the sequencing bits may, for example, be adopted thus establishing an appreciable overhead to allow for an optimum selection of sequences.

Extracting the initial data stream from the encoded data stream may be accomplished with the same circuitry, this time acting as a direct sequence decoder (DSD), as shown in Figure 4b. In this figure a PNSG 61 is coupled to one input terminal of an exclusive OR gate 63, the other terminal of which is coupled to receive the encoded data stream. PNSG 61 is in synchronism with the encoded data stream thereby providing the original data stream at the output terminal of exclusive OR gate 63.

Turning back again to Figure 2, to provide minimum sidelobes for the transmitted signals the N coded data streams at the PNSG bit rate are combined in pairs and provided at an intermediate frequency (IF) spectrum by minimum shift key (MSK) modulators 65-1 through 65-N/2. These MSK modulators provide a sequence of pulses at the intermediate frequency which constitute the coded signals. These signals are not infinite sequences, existing only for a small fraction of a frame time. Signals of this type exhibit spectral lobes within a sin(x)/x envelope determined by the width of the pulses in the sequence. Such a spectrum is represented in Figures 5a and 5b. If the width of the pulses within the sequence is equal to T, the nulls of the sin(x)/x are at frequencies spaced from the center frequency equal to the reciprocal of the pulse width. Spectral lobes within the envelope have frequency spacing that are equal to the repetition rate of the pulses of the sequence, as shown in Figure 5b, which is an expanded view of the area 67 in Figure 5a. The width of these lobes is a function of the number of pulses in the sequence and the repetition rate and is equal to twice the repetition rate divided by the number of pulses plus one. Though not shown in the Figure each spectral lobe has a number of side lobes associated therewith.

Each MSK modulator uses a different modulation carrier frequency. If the initial frequency is equal to K times the repetition frequency and each succeeding frequency is displaced from this initial frequency by i/(N+1) f(rep) is should be apparent that when i equals N the gap between two spectral lobes will be filled as illustrated in Figure 5c. A summation network 69 is coupled to the output terminals of the MSK modulators to receive modulated signals and provide the summation thereof to a mixer 71 wherein they are converted and coupled via a bandpass filter 73 for transmission.

The combination of direct sequence encoding and minimum shift key modulation establishes a noise like spectral distribution for the radiated signal, spreading the signal energy over a relatively wide band of frequencies. This spread spectrum radiation has a very low power spectral density which would be deep in the noise of analog detectors operating in a finite band. Consequently these signals may radiate in the VHF and UHF taboo bands and not interfere with analog transmissions in these bands.

Referring to Figure 6 the transmitted signal is received and heterodyned in mixer 75 operating at a local oscillator (LO) frequency and passed through band pass filter 77 to a bank of MSK demodulators 79-1 through 79-N/2. Each of these demodulators operates at a demodulation carrier frequency corresponding to a modulation carrier frequency used in the transmitter. As a result, N nearly identical baseband spectrum are generated. Each baseband signal is coupled to an associated comb filter in a bank of comb filters 81-1 through 81-N to suppress unwanted and unnecessary spectral components and improve interchannel isolation. These filtered signals are then coupled to N direct sequence decoders (DSD) 83-1 through 83-N to restore the original equal length equal bit rate data streams. A clock signal for the different DS decoders is provided by input 82, and synchronization for this decoding is provided on synchronisation signal connection 85 from the main channel TV signal. Each equal length, equal bit rate data stream is coupled to a demultiplexer/buffer memory 87 wherein the demultiplexing operation reestablishes the original six DPCM encoded signals. Decoding of the DPCM encoded signals is accomplished in decoders 89a through 89f as previously described with reference to Figure 3b. Reestablishment of the

high definition TV coded signals continues with the digital to analog (D/A) conversion of the decoded DPCM signals in digital to analog converters 91a through 91f. The enhancement signals, in analog form, corresponding to LD2, LD4, and the left and right panel enhancement signals are coupled through low pass filters 93a-93c, converted to digital signals in analog to digital converters (A/D) 95a - 95c whereat the left and right panel encoded signals have been reestablished. The LD2 and LD4 are further processed by time compressing these digital signals by 4:3 in compressors 97a-97b.

The analog luminance and chrominance signals are frequency shifted in mixers 99a - 99c, bandpass filtered in filters 101a - 101c, converted to digital signals in analog to digital (A/D) converters 95d - 95f wherefrom reestablished encoded luminance and chrominance signals are provided.

Finally, all signals are coupled to a HDTV decoder 103 which provides RGB signals suitable for display on a display device (not shown).

Claims

1. An apparatus for transmitting a multiplicity of digital data streams comprising:

   bit rate reducing means coupled to receive said digital data streams at predetermined bit rates for providing converted digital data streams at bit rates reduced from said predetermined bit rates;

   means coupled to said bit rate reducing means for sequentially positioning said converted digital data streams and for equalizing the bit rates of said converted digital data streams, thereby providing a multiplicity of converted digital data streams having equal bit rates; and

   means coupled to said sequentially positioning means for modulating said multiplicity of converted digital data streams on a carrier signal for transmission.

2. The transmitter of Claim 1 wherein said bit rate reducing means includes first reduction means for providing a first bit rate reduction and second reduction means coupled to said first reduction means for providing a digital signal representative of differences between an actual digital signal and a predicted digital signal corresponding thereto.

3. The transmitter of Claim 1 wherein said modulating means includes a multiplicity of direct sequence encoders coupled to said sequencing means to respectively receive said converted digital data streams, a plurality of minimum shift key modulators each coupled to a pair of said direct sequence encoders, and summing means coupled to said plurality of minimum shift key modulators for providing a sum of signals emitted from said minimum shift key modulators for transmission.

4. The transmitter of Claim 1 wherein said digital signals are coded augmentation signals for high definition television systems.

5. An apparatus for receiving a transmitted carrier signal modulated with a multiplicity of equal bit rate digital data streams derived from input digital signals coupled to input terminals of a transmitter comprising:

   means for receiving and demodulating said carrier signal to provide said multiplicity of digital data streams at a multiplicity of output terminals;

   means coupled to said demodulating means for sequentially positioning said digital data streams and for altering the bit rates of said digital data streams, thereby providing a plurality of digital data signals at a plurality of bit rates; and

   means coupled to said sequentially positioning means for processing said plurality of digital data signals to provide signals representative of said digital data signals coupled to said input terminals of said transmitter.

6. The receiver of Claim 5 wherein said demodulating means includes a plurality of minimum shift key demodulators coupled to receive said carrier signal each providing a pair of demodulated signals; and

   a multiplicity of direct sequence decoders coupled respectively to receive said demodulated signals and provide said multiplicity of digital data streams at output terminals thereof.

7. The receiver of Claim 6 wherein said processing means includes means coupled to said positioning means for adding differential digital signals to corresponding predicted digital signals.

8. The receiver of Claim 5 wherein said digital data streams are coded augmentation signals for high definition television systems.

9. A method for transmitting a multiplicity of digital data streams at predetermined bit rates comprising the steps of:

   reducing said predetermined bit rates to provide data streams at reduced bit rates;

   positioning said digital data streams at reduced bit rates to form a sequential arrange-

high definition TV coded signals continues with the digital to analog (D/A) conversion of the decoded DPCM signals in digital to analog converters 91a through 91f. The enhancement signals, in analog form, corresponding to LD2, LD4, and the left and right panel enhancement signals are coupled through low pass filters 93a-93c, converted to digital signals in analog to digital converters (A/D) 95a - 95c whereat the left and right panel encoded signals have been reestablished. The LD2 and LD4 are further processed by time compressing these digital signals by 4:3 in compressors 97a-97b.

The analog luminance and chrominance signals are frequency shifted in mixers 99a - 99c, bandpass filtered in filters 101a - 101c, converted to digital signals in analog to digital (A/D) converters 95d - 95f wherefrom reestablished encoded luminance and chrominance signals are provided.

Finally, all signals are coupled to a HDTV decoder 103 which provides RGB signals suitable for display on a display device (not shown).

Claims

1. An apparatus for transmitting a multiplicity of digital data streams comprising:

   bit rate reducing means coupled to receive said digital data streams at predetermined bit rates for providing converted digital data streams at bit rates reduced from said predetermined bit rates;

   means coupled to said bit rate reducing means for sequentially positioning said converted digital data streams and for equalizing the bit rates of said converted digital data streams, thereby providing a multiplicity of converted digital data streams having equal bit rates; and

   means coupled to said sequentially positioning means for modulating said multiplicity of converted digital data streams on a carrier signal for transmission.

2. The transmitter of Claim 1 wherein said bit rate reducing means includes first reduction means for providing a first bit rate reduction and second reduction means coupled to said first reduction means for providing a digital signal representative of differences between an actual digital signal and a predicted digital signal corresponding thereto.

3. The transmitter of Claim 1 wherein said modulating means includes a multiplicity of direct sequence encoders coupled to said sequencing means to respectively receive said converted digital data streams, a plurality of minimum shift key modulators each coupled to a pair of said direct sequence encoders, and summing means coupled to said plurality of minimum shift key modulators for providing a sum of signals emitted from said minimum shift key modulators for transmission.

4. The transmitter of Claim 1 wherein said digital signals are coded augmentation signals for high definition television systems.

5. An apparatus for receiving a transmitted carrier signal modulated with a multiplicity of equal bit rate digital data streams derived from input digital signals coupled to input terminals of a transmitter comprising:

   means for receiving and demodulating said carrier signal to provide said multiplicity of digital data streams at a multiplicity of output terminals;

   means coupled to said demodulating means for sequentially positioning said digital data streams and for altering the bit rates of said digital data streams, thereby providing a plurality of digital data signals at a plurality of bit rates; and

   means coupled to said sequentially positioning means for processing said plurality of digital data signals to provide signals representative of said digital data signals coupled to said input terminals of said transmitter.

6. The receiver of Claim 5 wherein said demodulating means includes a plurality of minimum shift key demodulators coupled to receive said carrier signal each providing a pair of demodulated signals; and

   a multiplicity of direct sequence decoders coupled respectively to receive said demodulated signals and provide said multiplicity of digital data streams at output terminals thereof.

7. The receiver of Claim 6 wherein said processing means includes means coupled to said positioning means for adding differential digital signals to corresponding predicted digital signals.

8. The receiver of Claim 5 wherein said digital data streams are coded augmentation signals for high definition television systems.

9. A method for transmitting a multiplicity of digital data streams at predetermined bit rates comprising the steps of:

   reducing said predetermined bit rates to provide data streams at reduced bit rates;

   positioning said digital data streams at reduced bit rates to form a sequential arrange-

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ment of digital data streams;

forming a multiplicity of equal length, equal bit rate digital data streams from said sequential arrangement of digital data streams; and

modulating said equal length, equal bit rate digital streams on to a carrier for transmission.

10. The method of Claim 9 wherein said digital data streams are coded augmentation signals for high definition television systems.

Patentansprüche

1. Anordnung zum Übertragen einer Vielzahl digitaler Datenströme mit:

Bitratenreduktionsmitteln zum Empfangen der genannten digitalen Datenströme mit vorbestimmten Bitraten zum aus den genannten vorbestimmten Bitraten Schaffen umgewandelter digitaler Datenströme mit reduzierten Bitraten;

mit den Bitratenreduktionsmitteln gekoppelten Mitteln zum sequentiellen Positionieren der genannten umgewandelten digitalen Datenströme und zum Ausgleichen der Bitraten der genannten umgewandelten digitalen Bitratenströme, wodurch eine Vielzahl umgewandelter digitaler Datenströme mit gleichen Bitraten geschaffen wird; und

mit den genannten Mitteln zur sequentiellen Positionierung gekoppelten Mitteln zum Modulieren der genannten Vielzahl umgewandelter digitaler Datenströme auf einem Übertragungsträgersignal.

2. Sender nach Anspruch 1, wobei das genannte Bitratenreduktionsmittel erste Reduktionsmittel aufweist zum Schaffen einer ersten Bitratenreduktion und mit den genannten ersten Reduktionsmitteln gekoppelte zweite Reduktionsmittel zum Schaffen eines digitalen Signals, das für die Unterschiede zwischen einem digitalen Ist-Signal und einem demselben entsprechenden vorhergesagten digitalen Signal repräsentativ ist.

3. Sender nach Anspruch 1, wobei das genannte Modulationsmittel eine Vielzahl mit dem genannten Sequentialisierungsmittel gekoppelter Direktsequenzcodierer zum jeweiligen Empfang der genannten umgewandelten digitalen Datenströme, eine Anzahl Modulatoren mit minimaler Umtastung, die mit je einem Paar der genannten Direktsequenzcodierer gekoppelt sind, und Summiermittel, die zum Liefern einer Summe von Signalen, die von den genannten Modulatoren mit minimaler Umtastung zur Übertragung gesendet werden, mit der genannten Anzahl Modulatoren mit minimaler Umtastung gekoppelt sind.

4. Sender nach Anspruch 1, wobei die genannten digitalen Signale codierte Verbesserungssignale für Hochauflösungsfernsehsysteme sind.

5. Anordnung zum Empfangen eines mit einer Vielzahl digitaler Datenströme gleicher Bitraten übertragenen Trägersignals, wobei diese Datenströme von digitalen Eingangssignalen hergeleitet sind, die Eingängen eines Senders zugeführt werden, mit:

Mitteln zum Empfangen und Demodulieren des genannten Trägersignals zum Schaffen der genannten Vielzahl digitaler Datenströme an einer Vielzahl von Ausgängen,

mit den genannten Demodulationsmitteln gekoppelten Mitteln zum sequentiellen Positionieren der genannten digitalen Datenströme und zum Ändern der Bitraten der genannten digitalen Datenströme, wodurch eine Anzahl digitaler Datensignale mit einer Anzahl Bitraten geschaffen wird, und

mit den genannten Mitteln zur sequentiellen Positionierung gekoppelten Mitteln zum Verarbeiten der genannten Anzahl digitaler Datensignale zum Schaffen von Signalen, die für die genannten digitalen Datensignale repräsentativ sind und den genannten Eingängen des genannten Senders zugeführt werden.

6. Empfänger nach Anspruch 5, wobei das genannte Demodulationsmittel eine Anzahl Demodulatoren mit minimaler Umtastung aufweist, die das genannte Trägersignal empfangen und je ein Paar demodulierter Signale schaffen; und

eine Vielzahl Direktsequenzdecoder vorgesehen sind zum Empfangen der genannten demodulierten Signale und zum Liefern der genannten Vielzahl digitaler Datenströme an Ausgängen desselben.

7. Empfänger nach Anspruch 6, wobei das genannte Verarbeitungsmittel mit den genannten Positionierungsmitteln gekoppelt ist zum Addieren digitaler Differenzsignale zu entsprechenden vorhergesagten digitalen Signalen.

8. Empfänger nach Anspruch 5, wobei die genannten digitalen Datenströme codierte Verbesserungssignale für Hochauflösungsfernsehsysteme sind.

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9. Verfahren zur Übertragung einer Vielzahl digitaler Datenströme mit vorbestimmten Bitraten, das die nachfolgenden Verfahrensschritte umfaßt:

das Reduzieren der genannten vorbestimmten Bitraten zum Schaffen von Datenströmen mit reduzierten Bitraten,

das Positionieren der genannten digitalen Datenströme mit reduzierten Bitraten zum Schaffen einer sequentiellen Gliederung digitaler Datenströme,

das Bilden einer Vielzahl digitaler Datenströme gleicher Länge und gleicher Bitrate aus der genannten sequentiellen Gliederung digitaler Datenströme, und

das Modulieren der genannten digitalen Datenströme gleicher Länge und gleicher Bitrate auf einem Übertragungsträger.

10. Verfahren nach Anspruch 9, wobei die genannten digitalen Datenströme codierte Verbesserungssignale für Hochauflösungsfernsehsysteme sind.

Revendications

1. Appareil d'émission d'une multiplicité de flux de données numériques comprenant :
   - des moyens réducteurs de débits binaires couplés pour recevoir lesdits flux de données numériques à des débits binaires prédéterminés afin de fournir des flux de données numériques convertis à des débits binaires réduits par rapport auxdits débits binaires prédéterminés,
   - des moyens couplés auxdits moyens réducteurs de débits binaires pour positionner en séquences lesdits flux de données numériques convertis et pour égaliser les débits binaires desdits flux de données numériques convertis de manière à obtenir une multiplicité de flux de données numériques convertis ayant des débits binaires égaux, et
   - des moyens couplés auxdits moyens de positionnement en séquences pour moduler ladite multiplicité de flux de données numériques convertis sur un signal porteur pour l'émission.

2. Emetteur selon la revendication 1, dans lequel lesdits moyens de réduction de débits binaires comprennent un premier moyen de réduction pour effectuer une première réduction de débit binaire et un deuxième moyen de réduction couplé audit premier moyen de réduction pour fournir un signal numérique représentatif de différences entre un signal numérique réel et un signal numérique prédit correspondant.

3. Émetteur selon la revendication 1, dans lequel lesdits moyens de modulation comprennent une multiplicité de codeurs à séquence directe couplés auxdits moyens de séquencement pour recevoir respectivement lesdits flux de données numériques convertis, une pluralité de modulateurs à modulation par déplacement de phase minimal dont chacun est couplé auxdits codeurs à séquence directe, et des moyens de sommation couplés à ladite pluralité de modulateurs à modulation par déplacement de phase minimal pour fournir une somme des signaux émis par lesdits modulateurs à modulation par déplacement de phase minimal pour l'émission.

4. Emetteur selon la revendication 1, dans lequel lesdits signaux numériques sont des signaux d'augmentation codés pour des systèmes de télévision à haute définition.

5. Appareil de réception d'un signal porteur émis modulé par une série de flux de données numériques à débits binaires égaux dérivés de signaux numériques d'entrée couplés aux bornes d'entrée d'un émetteur, comprenant :
   - des moyens pour recevoir et démoduler ledit signal porteur afin d'obtenir ladite série de flux de données numériques à une multiplicité de bornes de sortie,
   - des moyens couplés auxdits moyens de démodulation pour positionner en séquences lesdits flux de données numériques et pour modifier les débits binaires desdits flux de données numériques, de manière à fournir une pluralité de signaux de données numériques à une pluralité de débits binaires, et
   - des moyens couplés auxdits moyens de positionnement en séquence pour traiter ladite série de signaux de données numériques afin d'obtenir des signaux représentatifs desdits signaux de données numériques auxdites bornes d'entrée dudit émetteur.

6. Récepteur selon la revendication 5, dans lequel lesdits moyens de démodulation comprennent une pluralité de démodulateurs à déplacement de phase minimal couplés pour recevoir ledit signal porteur, chacun de ces démodulateurs fournissant une paire de signaux démodulés, et
   - une série de décodeurs à séquence directe couplés respectivement pour recevoir lesdits signaux démodulés et fournir

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ladite multiplicité de flux de données numériques à leurs bornes de sortie.

7. Récepteur selon la revendication 6, dans lequel lesdits moyens de traitement comprennent des moyens couplés auxdits moyens de positionnement pour ajouter des signaux numériques différentiels à des signaux numériques prédits correspondants.

8. Récepteur selon la revendication 5, dans lequel lesdits flux de données numériques sont des signaux d'augmentation codés pour des systèmes de télévision à haute définition.

9. Procédé d'émission d'une multiplicité de flux de données numériques à des débits binaires prédéterminés comprenant les étapes consistant à :
   - réduire lesdits débits binaires prédéterminés pour obtenir des flux de données à des débits binaires réduits,
   - positionner lesdits flux de données numériques à des débits binaires réduits pour former un agencement séquentiel de flux de données numériques,
   - former une multiplicité de flux de données numériques de longueurs égales et de débits binaires égaux à partir dudit agencement séquentiel des flux de données numériques, et
   - moduler lesdits flux numériques de longueurs égales et de débits binaires égaux sur une porteuse pour l'émission.

10. Procédé selon la revendication 9, dans lequel lesdits flux de données numériques sont des signaux d'augmentation codés pour des systèmes de télévision à haute définition.